

G.PATH-SBA-1-70

1. Which of the following immunoglobulin (Ig) isotypes has the highest concentration in serum?

- IgA
- IgD
- IgE
- IgG ✔Correct answer
- IgM

IgG is the major serum immunoglobulin (Ig) while IgA is the predominant Ig in secretions and so protects mucous membranes.

2. Immunity conferred by immune responses involving plasma cells is described as?

- acquired immunity
- cellular immunity
- humoral immunity ✔Correct answer
- innate immunity
- passive immunity

Humoral immunity refers to antibody-mediated responses. Plasma cells are terminally differentiated B lymphocytes which secrete antibody.

3. Cyclosporin acts by?

- inhibiting interleukin (IL)-2 receptor expression
- decreasing IL-2 release ✔Correct answer
- increasing IL-10 production
- decreasing CD4 expression
- decreasing expression of the T cell receptor

Cyclosporin works by inhibiting release of interleukin (IL)-2 from T cells, thereby inhibiting their proliferation. IL-10 is a natural anti-inflammatory cytokine but no successful analogues are available in clinical practice.

4. Which of the following is associated with hyperacute allograft rejection?

- cytotoxic T cells
- decay-accelerating factor
- major histocompatibility complex (MHC) class II
- natural killer (NK) cells
- pre-existing humoral antibodies ✔Correct answer

Hyperacute graft rejection occurs within minutes of transplantation and is a consequence of pre-existing humoral antibodies. These are usually due to pre-sensitisation to major histocompatibility complex (MHC) class I or to blood group incompatibility.

5. An allograft is?

- tissue from one individual transplanted to another ✔Correct answer

- tissue which is identically matched for human leukocyte-associated antigen (HLA)
- tissue from an animal transplanted to a human
- tissue transplanted from one site to another in a single individual
- artificial tissue implanted into an individual

An allograft is an organ graft between individuals of the same species. In practice these are matched as closely as possible for human leukocyte-associated antigen (HLA), but are rarely identical. An autologous transplant is when the organ e.g. skin is moved from one part of the body to another. A xenograft is an organ transplant from another species e.g. pig to another e.g. human.

6. Graft versus host disease occurs when?

- immunocompetent cells from the recipient react with the donor tissue
- immune cells which are carried within a transplanted organ react with donor tissue
- the transplant recipient has already been sensitised to the donor tissue
- immunocompetent stem cells are transplanted to an individual ✔ Correct answer
- natural killer cells are present in the donor tissue transplant

Graft versus host disease occurs when immunocompetent cells in the transplanted organ e.g. bone marrow attack the recipient. In practice this is prevented by irradiation of the recipient bone marrow and by T cell depletion of the transplanted bone marrow.

7. Skin grafts between individuals rarely reject even when they are not fully human leukocyte-associated antigen (HLA) matched because?

- the skin has a poor blood supply
- local immunosuppressive factors are produced by the transplant
- human leukocyte-associated antigen (HLA) expression is low in the skin
- immune cells are unable to penetrate the superficial layers of skin
- 'burn' tissue is relatively immunosuppressed ✔ Correct answer

Certain tissues appear to do well after transplantation even after modest human leukocyte-associated antigen (HLA) matching. Liver transplants are thought to express less class I major histocompatibility complex (MHC), and so HLA matching appears not to correlate with outcome. Burnt skin becomes relatively immunosuppressed and therefore fails to reject transplants. The cornea is relatively avascular thus protecting it from rejection.

8. A 25-year-old woman with lupus has double-stranded DNA (dsDNA) antibodies and a grade 3 glomerulonephritis. Which of the following most accurately describes the immunopathological process?

- activation of the alternative complement pathway
- type II hypersensitivity reaction
- type I hypersensitivity reaction
- activation of the classical complement pathway ✔ Correct answer
- a complement deficiency

Activation of the classical complement pathway occurs in systemic lupus erythematosus (SLE) due to the large number of double-stranded DNA (dsDNA) immune complexes that form and are able to fix complement. These are deposited in the kidneys and other organs, where they attract other components of the immune system and tissue damage ensues. Complement consumption is common in active disease in these cases. It could also be described as a type III hypersensitivity reaction.

9. A 25-year-old man presents with fever, rash and arthralgia. He has ++ protein and + blood on urinalysis. Investigations reveal erythrocyte sedimentation rate (ESR) 32, C-reactive protein (CRP) 12, Full blood count (FBC) and urea and electrolytes (U+Es) normal. ASO (antistreptolysin O) titres are raised. What immunological phenomenon is taking place?

- type I hypersensitivity reaction
- type II hypersensitivity reaction
- type III hypersensitivity reaction ✔Correct answer
- type IV hypersensitivity reaction
- cryoglobulinaemia

He has a post-streptococcal glomerulonephritis, an immune complex disease. Other infectious causes of immune complex disease include hepatitis B and C, cytomegalovirus (CMV) and malaria.

10. A 22-year-old woman attends the emergency department with an acute presentation of hereditary angioedema. What is the appropriate immediate management?

- antihistamines
- adrenaline
- fresh frozen plasma ✔Correct answer
- recombinant C1 esterase
- aspirin

This condition is due to the **deficiency of C1 esterase inhibitor**. This causes uncontrolled activation of the classical pathway resulting in angioedema. Patients often present with oro-facial swelling which can cause respiratory obstruction, and abdominal pain. They do not get itching as this is not a type I hypersensitivity reaction, and it does not respond to antihistamines. C2 and C4 often fall during an acute attack while C3 levels remain unchanged. It needs to be treated with **the inhibitor which is present in fresh frozen plasma or in recombinant preparations**.

11. Which chemokine receptor is the coreceptor for HIV viral entry into T cells?

- methyl-accepting chemotaxis protein (MCP)-1
- CD40
- CCR-5 ✔Correct answer
- interleukin (IL)-8
- CD4

CCR-5 has been identified as the coreceptor with CD4 for HIV entry into T cells. It was discovered after a group of prostitutes in Thailand failed to contract the disease despite high exposure to the virus. These individuals subsequently were shown to be deficient in the chemokine receptor. In vitro HIV infection could also be inhibited by excess chemokine ligand which effectively competed for binding at the receptor. Novel strategies for CCR-5 receptor blockage in HIV are being examined.

12. In HIV, to what level does the CD4 count normally drop to, before an individual is at risk of opportunistic infection?

- 800×10 to the power of 6/l
- 200 ✔Correct answer
- 100
- 50
- <10

The CD4 count is a marker of T helper cell numbers and is normally above 800. Although there is often a transient mild drop on seroconversion, the count may be maintained for up to 10 years (and longer if on treatment) before it falls. If untreated, a linear fall in the CD4 count is associated with the development of a number of AIDS-defining diseases. The first is usually *Pneumocystis carinii* pneumonia (PCP) when the count is about 300. This is a reliable marker of an at-risk individual and is used as a clinical indication for PCP prophylaxis. Counts of around 100 put an individual at risk of toxoplasmosis and cryptosporidium, and counts of 50 indicate susceptibility to the atypical tuberculosis (TBs) such as avian intracellular TB. Other AIDS-defining diagnoses are less predictable by CD4 count such as lymphoma, Kaposi's sarcoma and mTB.

13. You review an elderly woman who has presented to the Emergency Department with dehydration resulting from severe diarrhoea. She was prescribed antibiotics for a recent respiratory tract infection.

Which of the following drugs would be the most likely cause of *Clostridium difficile* diarrhoea?

- Penicillin V
- Ciprofloxacin
- Clarithromycin
- Metronidazole
- Cephalixin ◀Correct answer

Cephalixin is the most likely of these antibiotics to be associated with *C. difficile* diarrhoea. Oral agents that are most likely to be associated with *C. difficile* include clindamycin, cephalosporins and augmentin. Cephalosporins given intravenously are also likely to be associated with *C. difficile*. *C. difficile* is a common bacterium and is found as a part of normal bowel flora in 3–5% of the normal population. When it causes problems with acute infection, two toxins are produced (A is an enterotoxin and B is cytotoxic and results in bloody diarrhoea). Symptoms range from mild diarrhoea to severe colitis, when the bowel mucosa may be covered by a pseudomembrane. Antibiotics treatment of choice is with oral metronidazole or vancomycin.

14. A 76-year-old diabetic woman presented with a non-healing ulcer on her right foot. Blood culture samples grew methicillin-resistant *Staphylococcus aureus* (MRSA).

Which of the following antibiotics may be considered in addition to iv vancomycin?

- Flucloxacillin
- Metronidazole
- Rifampicin ◀Correct answer
- Ticarcillin
- Ampicillin

Rifampicin may be used in combination for MRSA infections. It should not be used as monotherapy for MRSA, as resistance may rapidly develop. Many hospital microbiology departments recommend combination therapy with intravenous vancomycin and teicoplanin. Other antibiotics to which there may be sensitivity include some macrolides, trimethoprim, sodium fusidate and aminoglycosides. Linezolid and combination therapy with quinupristin and dalfopristin are other possible options but these should be reserved for patients with organisms that are resistant to other combinations or for those with tolerability issues to other combinations.

15. The polymerase chain reaction (PCR) is becoming widely used in both research and clinical medicine. Which of the following statements is correct?

- The *Taq* polymerase used is of viral origin
- After approximately 30 cycles, a million cDNA copies can theoretically be made from a single target copy
- Cycling of the reaction-mixture temperature enables sequential extension, annealing and denaturation
- Specific sense and antisense primers that bind to part of the downstream target sequence are used as the starting point of the polymerase
- Reverse transcriptase-PCR (RT-PCR) is able to identify the transcripts of a given gene by detecting the messenger (m) RNA coding for the gene ◀Correct answer

The *Taq* polymerase is derived from the bacterium *Thermus aquaticus*. After approximately 30 cycles, 10^9 cDNA copies can theoretically be made from a single target copy. Cycling of the reaction-mixture temperature enables sequential denaturation

(separation of the double-stranded template), annealing (binding of the primers to their targets) and extension (copying of the target sequence by *Taq* polymerase in 5' to 3' direction). Specific sense and antisense primers that bind to part of the upstream target sequence are used as the starting point of the polymerase.

16. Which of the following tumour-associated antigens is linked with the correct cancer?

- CA-125: Testicular teratoma
- CA 19-9: Pancreatic cancer ✔ Correct answer
- Alpha-fetoprotein: Ovarian cancer
- CEA: Hepatocellular carcinoma
- HCG: Breast cancer

CA-125 is associated with ovarian epithelial cancers. CA 19-9 with pancreatic and some colorectal cancers. Alpha-fetoprotein is associated with hepatocellular carcinoma, hepatoblastoma, testicular teratoma and yolk sac tumours. CEA is associated with colon carcinoma and some head and neck and lung cancers. HCG is associated with germ-cell ovarian tumours, choriocarcinoma, testicular teratoma and seminoma.

17. Granuloma is seen in which of the following conditions?

- Syphilis ✔ Correct answer
- Typhoid
- Cholera
- Amoebiasis
- Shigellosis

A granuloma is a collection of macrophages: giant cells as a nidus of chronic inflammation. The centre may necrotise to form caseation, classically in tuberculosis. There is a long list of infective and immunological conditions where a granulomatous response may be seen, including tertiary syphilis, sarcoidosis and Crohn's and Wegener's granulomatosis.

18. A 42-year-old man with type-1 diabetes mellitus, which was diagnosed 23 years ago, is admitted to hospital with diabetic ketoacidosis. He is complaining of abdominal pain. Which of the following findings on admission would most suggest a precipitating cause of this illness?

- Serum amylase activity of 1244 U/l (upper limit of normal, 150 U/l) ✔ Correct answer
- Serum creatinine concentration 140 $\mu\text{mol/l}$
- Serum lactate concentration 4.3 mmol/l
- Serum triglyceride concentration 12.2 mmol/l
- White cell count of $15 \times 10^9/\text{l}$

Patients in DKA often have elevated serum amylase activities as a result of decreased renal excretion of the enzyme, but a level this high is very suggestive of pancreatitis. Hypertriglyceridaemia is common in uncontrolled diabetes. An increased white cell count can occur in any acute illness and does not specifically indicate infection. The serum creatinine concentration is often slightly raised in patients with DKA (even in the absence of diabetic nephropathy) as a result of a decreased glomerular filtration rate. Decreased tissue perfusion as a result of dehydration often leads to an element of lactic acidosis in addition to the ketoacidosis.

19. In an adult patient with cirrhosis, which of the following findings is the most reliably diagnostic of hereditary haemochromatosis as the cause?

- Liver biopsy ✔ Correct answer
- Serum ferritin concentration
- Serum iron concentration
- Serum total iron-binding capacity

Transferrin saturation

In hereditary haemochromatosis (HH), the excess iron is primarily found in parenchymal cells, whereas with secondary iron overload, accumulation tends to be in Kupffer cells. Liver biopsy can demonstrate this, allows assessment of liver damage and is of prognostic value. Serum ferritin concentrations are almost always markedly elevated, but elevations can occur in any inflammatory condition (including other liver diseases). Serum iron concentration is normal in approximately 25% of patients with HH and can be elevated in healthy individuals or people with secondary iron overload. Total iron-binding capacity reflects the transferrin concentration, which is usually normal in haemochromatosis. Moreover, although transferrin saturation is typically high in HH, it can also be increased in other iron overload conditions and in liver disease. Molecular genetic analysis and demonstration of homozygosity for the C282Y mutation, or of compound heterozygosity for C282Y and H63D, can detect asymptomatic individuals at risk of developing clinical haemochromatosis.

20. A 40-year-old woman patient has been referred to hospital with jaundice. On examination there is hepatosplenomegaly. She does not take any medication nor drinks alcohol. Her sister, who is 10 years older, had similar problems. Following serum testing, antibodies to which antigen are most likely to be detected in her serum?

Double-stranded DNA

Proteinase 3

Mitochondria ◀Correct answer

T cells

Immunoglobulins

Over 95% of patients with primary biliary cirrhosis have antibodies to mitochondria, with the dominant autoantibody response being directed against two components (dihydropyridine acetyltransferase (E2) and E3-binding protein) of the pyruvate dehydrogenase complex (PDC). The loss of tolerance to these autoantigens is an early event in this progressive disease, with antimitochondrial antibodies (AMA) being detectable in serum before abnormalities in liver function and long before the onset of symptoms.

21. A 22-year-old man presents with a long history of intermittent abdominal discomfort and diarrhoea. On examination, he has a body mass index of 19 kg/m² and is clinically anaemic. Coeliac disease is suspected. Which of the following investigations will most reliably diagnose this condition?

Detection of antigliadin antibodies in serum

Detection of endomysial antibodies in serum

Detection of tissue transglutaminase antibodies in serum

Microscopic examination of a small bowel biopsy specimen ◀Correct answer

Xylose absorption test

The detection of the typical appearance of subtotal villous atrophy on a small bowel biopsy is regarded as the 'gold standard' for the diagnosis of coeliac disease. However, detection of tissue transglutaminase antibodies has high specificity and sensitivity and is widely used as a screening test. Tissue transglutaminase is the antigen detected by endomysial antibodies. Antigliadin antibodies are less sensitive. The xylose absorption test is a non-specific test for intestinal malabsorption.

22. Endothelin-1:

Is a vascular cell-adhesion molecule

Is a polypeptide ◀Correct answer

Is also known as ICAM-1

Is a heat-shock protein

Was formally known as IL-1

Endothelin-1 is a 21-amino acid polypeptide and is a highly potent vasoconstrictor. Levels increase when endothelium is stressed, for example in trauma or oxidative stress. It plays a part in the modulation of vascular tone. Endothelin-1 may also have a role in diseases such as Raynaud's. ICAM-1 is a cellular adhesion molecule (I = intracellular), which is increased during

inflammation and by IL-1, an interleukin. Heat-shock proteins (HSPs) are also increased during tissue stress and have many different roles.

23. Nitric oxide is derived from

- Cyclic GMP
- Endothelium-derived relaxing factor
- GTN
- L-Arginine ✔ Correct answer
- Nitrous oxide

Nitric oxide (NO), which used to be known as 'endothelium-derived relaxing factor', is a local cellular messenger. It is derived from L-arginine (an amino acid) by nitric oxide synthase. Its actions increase the levels of intracellular cGMP (cyclic guanosine monophosphate), which has effects depending on which cell it is acting upon. These include modulation of vascular tone (hence the therapeutic use of glyceryl trinitrate, a synthetic compound) and memory. NO has also been implicated in septic shock, adult respiratory distress syndrome (ARDS) and inflammation. Nitrous oxide, also known as 'laughing gas', is often used in obstetrics and trauma for pain relief.

24. A 50-year-old company director was admitted to hospital due to a myocardial infarction. He was thrombolysed and received a coronary artery bypass graft. The lesion leading to the myocardial infarction started many years ago with foam cells.

What is the most likely cell contributing to this formation?

- Endothelial cells
- Fibroblasts
- Lymphocytes
- Macrophages ✔ Correct answer
- Erythrocytes

The earliest lesions of atherosclerosis are fatty streaks. These consist of an accumulation of lipid-engorged macrophages (foam cells). The fatty streaks progress to intermediate lesions (or transitional plaque), composed mainly of macrophage foam cells and smooth muscle cells which migrate into the intima from the media.

With time, these develop into raised fibrous (advanced) plaques, characterised by a dense fibrous cap of connective tissue and smooth muscle cells overlying a core containing necrotic material and lipid, mainly cholesterol esters, which may form cholesterol crystals on histological section. The necrotic core is a result of apoptosis and necrosis, increased proteolytic activity and lipid accumulation.

Fibrous plaques also contain a large number of macrophage foam cells, T cells and smooth muscle cells. This collection of cells, surrounding the necrotic core, promotes plaque growth. The plaque undergoes vascularisation and microvessels develop in connection with the artery's vasa vasorum. The new vessels provide a channel for the access of inflammatory cells and may also lead to intraplaque haemorrhage and thus weaken the plaque. Advanced atherosclerotic plaques frequently accumulate calcium, due to the presence of proteins specialised in binding calcium (osteocalcin, osteopontin, bone morphogenic proteins).

The advanced plaque is the substrate from which the complicated plaque develops, leading almost inevitably to clinical symptoms. The complicated plaque has a thin cap, especially at the shoulders or margins of the lesion, and may contain ulcerations, fissures, erosions or cracks. These provide sites of platelet adherence, aggregation and thrombosis. The thin fibrous cap may break or tear leading to haemorrhage into the necrotic core and thrombosis.

25. A 49-year-old woman presents to her gynaecologist with CIN-3 changes. She has been reading on the Internet about how the human papillomavirus interferes with the programmed death of defective cells and may predispose to cancers. Which of the following protein names best identifies the DNA-binding protein with which the papillomavirus interferes?

- p52
- p51
- p53 ✔ Correct answer
- p54
- p55

p53 is a DNA-binding protein which induces the expression of a number of genes that are involved in programmed cell death. Clearly, p53 gene mutations or products that interfere with p53 protein functioning are implicated in carcinogenesis. Initial p53 gene expression causes genes involved in DNA repair to be expressed. If DNA repair is too slow or gene repair cannot be effected, then other genes involved in apoptosis take over, and programmed cell death ensues.

Both the adenovirus E1B and papillomavirus E6 gene products bind p53 and interfere with its functioning. Another protein involved in the cell cycle and triggering of apoptosis is the RB protein, the functioning of which is interfered with by a number of viruses including papillomavirus, adenovirus and the SV40 virus.

26. When planning the radiotherapy dosage for solid tumours, it has to be remembered that the division of cells is governed by the cell cycle, the mechanism of which is disrupted by radiation. Which of the following is true concerning the cell cycle?

- M represents the phase of premitotic DNA synthesis
- G₁ is a gap phase under the influence of the p53 gene Correct answer
- S is the mitotic phase
- G₂ is a gap phase when cells contain half as much DNA as non-dividing cells
- In normal tissues, cells with significant damage to their DNA are arrested at the M phase

G₂ is a gap phase when cells contain twice as much DNA as non-dividing cells. M is the mitotic phase. G₁ is a gap phase under the influence of the p53 gene. G₀ is a resting stage with non-dividing cells; S represents premitotic DNA synthesis. In normal tissues, cells with significant damage to their DNA are arrested at the G₁ phase

27. Which of the following statements is true about the matrix metalloproteinases, which play a major role in pathological processes, including rheumatoid arthritis, periodontitis, vascular disease as well as tumour invasion and metastasis?

- All are controlled by specific tissue stimulators of the metalloproteinases
- All contain an iron atom
- Each is involved in the synthesis of at least one component of the extracellular matrix, basement membrane proteins and bioactive mediators
- All are secreted as a proenzyme, which in each case is activated by cleavage of defined glycoprotein sequences
- All share sequence homologies Correct answer

The matrix metalloproteinases (MMPs) are a family of 24 proteolytic enzymes that share common characteristics. All are inhibited by specific tissue inhibitors of the metalloproteinases (TIMPS). All contain a zinc atom. Each is involved in the degradation of at least one component of the extracellular matrix and of basement membrane proteins and bioactive mediators. All are secreted as a proenzyme, which in each case is activated by cleavage of defined peptide sequences. All are involved in normal remodelling processes, such as embryonic development, postpartum involution of the uterus, bone and growth-plate remodelling, ovulation and wound healing. A range of MMP inhibitors is currently under development for the treatment of solid tumours.

28. Which of the following statements is true concerning kinins?

- They are lipids
- They promote vasoconstriction
- They decrease the permeability of blood vessels
- They are proteins that attract phagocytes Correct answer
- They perforate invading bacteria

Kinins are proteins that attract phagocytes, promote vasodilatation and increase the permeability of blood vessels. Complement perforates invading bacteria, dilates blood vessels, stimulates histamine release and attracts neutrophils

29. Which of the following is true concerning complement activation?

- IgG and IgE are the main antibody classes involved in classical pathway activation
- C1q binds to the Fab regions of antigen-complexed IgG antibodies

The alternative, but not the classical C3, convertase enzyme involves C3b Correct answer

Elevated serum C3dg is a good marker of complement activation

The membrane-attack complex involves polymerisation of C7

IgG and IgM are the main antibody classes that activate the classical pathway. C1q binds to the Fc rather than the Fab fragment that binds antibody (Fc, crystallisable fragment; Fab antigen-binding fragment). It is C9 that polymerises in the membrane-attack complex. Clotting of blood can lead to complement activation, and hence complement conversion products must be measured on plasma and not serum.

30. Regarding B cells and plasma cells, which of the following is true?

B cells and plasma cells have surface-bound IgG

B cells and plasma cells have surface MHC class II

Plasma cells can undergo somatic hypermutation

B cells can undergo isotype switching Correct answer

Plasma cells can undergo isotype switching

B cells have surface IgG and MHC class II, undergo somatic hypermutation and isotype switching (ie switching through the immunoglobulin classes). **Plasma cells are fully differentiated cells from B cells, and hence lack these features.**

31. In a 20-year-old man, recurrent and/or severe infections with which of the following organisms would make you suspect immunodeficiency associated with hypogammaglobulinaemia?

Haemophilus influenzae Correct answer

Streptococcus pyogenes

Herpes simplex virus

Candida spp

Pneumocystis jiroveci

Infections with *Haemophilus influenzae* and *Streptococcus pneumoniae* occur with this condition, not *Streptococcus pyogenes*. *Pneumocystis jiroveci* (formerly *P. carinii*), viral and candida infections are associated with T-cell deficiencies, including HIV infection.

32. A patient collapses during induction with a general anaesthetic. Which of the following investigations will be most useful in subsequently establishing an IgE-mediated process (anaphylactic mechanism)?

Elevated serum tryptase at approximately 1 hour after collapse

Total serum IgE level

Skin-prick tests to anaesthetic agents Correct answer

Serum/plasma C3 and C4 levels

Specific IgE to latex

Although tryptase measurements indicate mast-cell degranulation, they do not point to the triggering mechanism. Total serum IgE is a test with little clinical value except in the interpretation of specific IgE measurements. Skin-prick tests performed at neat and 1:10 dilutions are the recognised investigations. Plasma complement levels are rarely helpful. Specific IgE to latex for investigating latex allergy may be helpful but is unlikely to be the cause of a reaction at induction, ie before the surgeon has a gloved hand inside the patient.

33. A 42-year-old, atopic, health-care worker presents with red weals and itchy hands within 20 minutes of wearing latex gloves. Which of the following mechanisms is most likely to be relevant?

Contact dermatitis

Complement-mediated

- Immune complex-mediated
- Delayed-type hypersensitivity
- IgE-mediated sensitivity ✔Correct answer

This is an immediate hypersensitivity reaction and hence will be IgE-mediated. **Delayed-type hypersensitivity, eg contact dermatitis, has an onset that usually exceeds 24 hours.** Complement-mediated (type-2 hypersensitivity) and immune complex (type-3 hypersensitivity) reactions typically produce vascular damage, and therefore bullae and petechiae would predominate in the skin.

34. Which of the following immunoglobulin isotypes has the highest concentration in serum?

- IgA
- IgD
- IgE
- IgG ✔Correct answer
- IgM

IgG is the major serum immunoglobulin, while IgA is the predominant immunoglobulin in secretions and so protects mucous membranes.

35. A patient with AIDS develops *Pneumocystis jiroveci* pneumonia. He is deficient of what immunological component?

- Complement
- T cells ✔Correct answer
- B cells
- IgM
- IgA

Patients with HIV have a deficiency of CD4 lymphocytes. The risk of developing *P. jiroveci* pneumonia is greatest with a CD4 count of $200 \times 10^9/l$ or below.

36. How is the Mantoux test administered?

- Intramuscular
- Subcutaneous
- Multiple subcutaneous places
- Intradermal ✔Correct answer
- Intravenous

Tuberculin skin testing should be done by the Mantoux method, as this is the only technique that has been standardised and extensively validated. An injection of 0.1 ml of purified protein derivative solution (PPD-S) is given intradermally in the volar surface of the forearm using a tuberculin syringe and small-gauge needle, causing a small wheal. Injection subcutaneously will result in uninterpretable results. Multipuncture devices should not be used. The amount of induration should be measured 2–5 days after the injection; measurements performed precisely 48–72 h later are not essential. The transverse diameter of induration should be measured in millimetres using a ruler. The edge of the induration can be seen and marked, or the margins can be detected using the ballpoint pen method, in which the pen is rolled over the skin with light pressure and its progress is stopped at the demarcation of the indurated area.

37. A 76-year-old patient is admitted to the acute admission unit with septic shock. Pulse is 106 and BP 90/40 mmHg. Urinary catheterisation produces 75 ml of concentrated urine. Which of the following principles applies to the choice of an appropriate intravenous fluid for resuscitation?

- Certain intravenous solutions, which would be hypo-osmolar, have dextrose added to ensure they are iso-osmolar ✔Correct answer

Hartmann's solution contains sodium, potassium, chloride, calcium and bicarbonate

An advantage of crystalloid solutions is that relatively small volumes have to be infused to restore an intravascular volume deficit

The normal colloid oncotic pressure is 70 mmHg

Albumin is indicated

Hartmann's solution contains sodium, potassium, chloride, calcium and lactate. It is not possible to store bicarbonate in solution with calcium; instead lactate is used which is metabolised to bicarbonate by the liver. A major disadvantage of crystalloid solutions is that relatively large volumes have to be infused to restore an intravascular volume deficit (the 3:1 replacement rule). The normal colloid oncotic pressure is 25 mmHg. The routine use of albumin is not indicated in resuscitation and may be harmful in some groups of patients.

38. A high titre of antineutrophilic cytoplasmic autoantibodies in a patient being investigated for vasculitis is most suggestive of?

Polyarteritis nodosa ✔ Correct answer

Lupus erythematosus

Rheumatoid arthritis

Systemic sclerosis

Drug-induced vasculitis

Antineutrophilic cytoplasmic autoantibodies are most commonly seen in patients with Polyarteritis nodosa. They may however also be present in patients with Churg-Strauss syndrome, Wegener's granulomatosis, and microscopic polyangiitis. Patients with Lupus usually demonstrate anti-nuclear antibodies as well as antibodies to dsDNA in their serum.

39. The most influential cytokine involved in coagulation activation is?

Interleukin-2

Interleukin-3

Interleukin-4

Interleukin-5

Interleukin-6 ✔ Correct answer

IL-2, IL-4 and IL-5 exert their effects on lymphocytes. IL-5 is also involved in eosinophil activation. IL-3 is secreted by T lymphocytes to stimulate the proliferation of haematopoietic progenitor cells. IL-6 together with tumor necrosis factor are the most influential cytokines involved in coagulation activation.

40. The presence of non-caseating granulomas and hypercalcaemia is most suggestive of?

Histoplasmosis

Sarcoidosis ✔ Correct answer

Tuberculosis

Berylliosis

Eosinophilic granuloma

In histoplasmosis, granulomas may form in the pulmonary parenchyma, hilar and mediastinal nodes. These are usually caseating and may develop both calcification and fibrosis. From the list above, sarcoidosis is the commonest cause of non-caseating granulomas. It is also associated with mild hypercalcaemia. Tuberculosis is the classic disease associated with caseating granulomas. Berylliosis results in non-caseating granulomas in the lungs, it is however less common than sarcoidosis and hypercalcaemia is also less common than in sarcoidosis. Eosinophilic granuloma is a form of neoplasia and not a granuloma.

41. Oncogenes are mutated forms of genes that cause normal cells to grow out of control and become cancer cells. The sis oncogene is a:

- Growth factor Correct answer
- Growth factor receptor
- Signal transducer
- Transcription factor
- Programmed cell death regulator

Sis is the best studied growth factor oncogene. It leads to the overproduction of platelet-derived growth factor, which stimulates cells to grow.

42. A good example of a growth factor receptor oncogene is?

- sis
- erb B-2* Correct answer
- ras*
- myc*
- bcl-2*

sis is a growth factor, ras is a signal transducer, myc is a transcription factor and bcl-2 is a programmed cell death regulator.

43. Tumor suppressor genes are normal genes that slow down cell division, repair DNA mistakes, and induce apoptosis. Abnormalities of which gene will prevent apoptosis?

- RB1
- p53 Correct answer
- erb B*
- abl*
- APC

RB1 and APC are genes that help control cell growth and reproduction. Abnormalities of the former gene can lead to retinoblastoma in infants. *erb B* and *abl* are not tumor suppression genes but oncogenes – a growth factor receptor and a signal transducer respectively.

44. The commonest gene mutation in the inherited cancer syndrome Li-Fraumeni involves which gene?

- INK4a
- BRCA2
- WT1
- p53 Correct answer
- VHL

INK4a is associated with melanoma, BRCA2 with breast cancer, WT1 with Wilms' tumor, and VHL with renal malignancy.

45. Immediate hypersensitivity reactions are mediated by?

- IgA
- IgD

IgE <<Correct answer

IgG

IgM

IgA is primarily secreted into the gastrointestinal and respiratory tracts where it prevents microbes from binding to epithelial cells. The function of IgD is still unclear. IgG and IgM are involved in complement activation and opsonisation.

46. Antigen binding to mast cells results in the release of both pre-formed and newly formed mediators. A newly formed mediator is?

Thromboxane <<Correct answer

Histamine

Tryptase

Heparin

eosinophilic chemotactic factor of anaphylaxis

Thromboxane is not pre-formed and results from activation of cyclooxygenase acting on arachidonic acid. Thromboxane causes vasoconstriction, platelet aggregation, and bronchoconstriction.

47. The commonest cause of a transient ischaemic attack is?

Thrombophilia

Atrial fibrillation

Myocardial infarction

Paradoxical embolus

Atherosclerosis of the carotid bifurcation <<Correct answer

Although all the above may give rise to embolisation within the arterial tree travelling to the cerebral circulation and presenting as a transient ischaemic attack, a 70% stenosis of the carotid bifurcation or proximal internal carotid artery is by far the commonest cause.

48. Which interleukin promotes mucus secretion?

Interleukin-4

Interleukin-5

Interleukin-6 <<Correct answer

Interleukin-13

Tumour necrosis factor

IL-4 and IL-13 promote helper T-cell proliferation and B cell IgE synthesis. IL-5 is involved with the activation and function of eosinophils. Tumour necrosis factor activates neutrophils, increases monocyte chemotaxis, as well as enhancing the production of other cytokines.

49. Which interleukin promotes mucus secretion?

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50. Which enzyme is responsible for the production of free radicals in neutrophils?

Superoxide dismutase

Vitamin E

Glutathione peroxidase

Catalase

NADPH oxidase ✔ Correct answer

NADPH oxidase is found in the wall of the endocytic vacuole. It acts as an electron donor to reduce oxygen to superoxide and hydrogen peroxide. **A to D are all antioxidants involved in the neutralisation of free radicals.**

51. Testing for factor V Leiden is warranted in patients with?

menorrhagia

recurrent DVTs ✔ Correct answer

an arterial embolus

transient ischaemic attacks

haemophilia

In Britain, 5% of the population carry one or more genes for Factor V Leiden. These patients are at an increased risk of venous thrombosis. This risk is 5 times greater than that of the general population. Factor V Leiden tests are indicated for venous thrombo-embolism presenting at a relatively young age, or in an unusual part of the body. They are also indicated when a patient has a strong personal or **family history of recurrent DVTs**, or when they are experiencing **unexplained miscarriages**.

52. The antibiotic of choice for a patient with MRSA septicaemia is?

Linezolid

Timentin

Vancomycin ✔ Correct answer

Imipenem

Piperacillin

Vancomycin or Teicoplanin are the antibiotics of choice for treating severe MRSA infections. Linezolid is usually reserved to those strains that are resistant to these two antibiotics. The other antibiotics listed above have no role in treating MRSA.

53. Clostridium difficile diarrhoea is best treated with?

Intravenous vancomycin

Oral metronidazole ✔ Correct answer

Oral amoxicillin + clavulanic acid

Intravenous timentin

Oral erythromycin

The standard treatment for clostridium difficile diarrhoea is oral metronidazole or oral vancomycin. Options C & D are common culprits in predisposing to this infection.

54. An absolute contraindication to renal transplantation is?

ABO incompatibility ✔Correct answer

Rhesus incompatibility

zero major histo-compatibility complex match

size mismatch

CMV positive donor to CMV negative recipient

Unlike ABO, Rhesus antigens do not play a major part in renal transplant rejection. With modern immunosuppressive therapy, it is now possible for live donation to take place between individuals with a six major histo-compatibility complex mismatch. Although size may play a part when performing transplants in children, it is not an absolute contraindication. **In the case of a CMV positive donor to a CMV negative recipient, the recipient will require prophylaxis with gancyclovir.**

55. In a patient with jaundice, the presence of Kayser-Fleischer ring is pathognomonic of?

Auto-immune hepatitis

Sclerosing cholangitis

Primary biliary cirrhosis

Haemochromatosis

Wilson's disease ✔Correct answer

In Wilson's disease, the presence of Kayser-Fleischer rings indicate neurological impairment. It consists of copper deposition in the cornea and may be seen as a greenish or golden brown ring around the cornea on slit lamp examination.

56. The blood film of a patient who had a splenectomy will reveal?

Target cells

Howell-Jolly bodies ✔Correct answer

Auer rods

Basophilic stippling

Hairy cells

Auer rods are elongated, bluish-red rods present in the cytoplasm of myeloblasts, promyelocytes and monoblasts. Their presence in the peripheral blood film is indicative of acute myeloid leukemia. **Basophilic stippling of red cells may be observed in lead poisoning,** exposure to some drugs, anaemias, or septicemia. Hairy cells are only seen in hairy cell leukemia. **Target cells are seen in hemolytic anaemias, especially sickle cell and thalassaemia.** Howell-Jolly bodies are nuclear fragments of condensed DNA that appear as spherical blue-black inclusions within red blood cells on Wright-stained smears.

57. Systemic Inflammatory Response Syndrome (SIRS) is present if a patient has?

temperature of 37.5°C, a leukocyte count of 11,000/mm³, heart rate 150 beats/min

Temperature of 38°C, a leukocyte count of 5,000/mm³, respiratory rate 15 breaths/min

Temperature of 35.5°C, a leukocyte count of 8,000/mm³, pCO₂ 50mmHg

temperature of 38.0°C, a leukocyte count of 2,000/mm³, respiratory rate 30 breaths/min ✔Correct answer

Temperature of 37.5°C, a leukocyte count of 11,000/mm³, heart rate 100 beats/min

A patient is said to have SIRS if he satisfies two or more of the following criteria: temperature > 38°C or < 36°C; heart rate > 90 beats/minute; respiratory rate > 20/min (or PaCO₂ < 32mm Hg); leukocyte count > 12,000/mm³ or < 4,000/mm³ (or > 10% immature (band) cells).

58. Which immunosuppressive drug used in transplantation acts by inhibiting the action of interleukin-2?

Rapamycin (Sirolimus) ✔Correct answer

Ciclosporin

Azathioprine

Mycophenolate mofetil (MMF)

Tacrolimus

Ciclosporin and Tacrolimus act by inhibiting interleukin-2 production . Azathioprine and Mycophenolate mofetil act by inhibiting purine/pyrimidine biosynthesis.

59. A 32-year-old woman who had undergone an appendectomy 2-weeks ago presents to her General Practitioner with a 24-hour history of right upper quadrant abdominal pain, fever with chills and rigors, and shortness of breath. She says that the pain is radiating to her right shoulder tip. On examination, her temperature is 38.9° C, pulse rate is 106/min and she is acutely tender over the right hypochondric region. Chest X-ray reveals a right-sided basal atelectasis and mild pleural effusion.

From the options below choose the ONE that you think is the most likely diagnosis in this patient:

Emphysema of right lung

Acute pancreatitis

Sclerosing cholangitis

Subphrenic abscess ✔Correct answer

Pyonephrosis

Subphrenic abscess usually arises 3 to 6 weeks following abdominal surgery, mainly to the biliary tract, duodenum or stomach, or following a perforated viscus or anastomotic leakage. The subphrenic space is in direct contact with the para-colic gutter thereby allowing peritoneal contamination such as bile, blood or bowel contents to spread. Subphrenic abscess is right-sided in about 50%, left-sided in 25% and bilateral in 25% of patients. Clinical features include pyrexia with chills and rigors, anorexia, loss of appetite and loss of weight. Diaphragmatic irritation may affect the lung, resulting in chest pain, dyspnoea and non-productive cough. Basal atelectasis, pneumonia and pleural effusion are recognised complications of this condition. Ultrasound scan is the investigation of choice to diagnose subphrenic abscess, and, if an abscess is identified, ultrasound guided percutaneous drainage catheter may be placed at the same time.

60. An 87-year-old lady who lives in residential care is brought to the Accident and Emergency department with a 24-hour history of abdominal pain of sudden onset. On examination, she is pale, cold and appears to be in shock. Her blood pressure is 102/68 mmHg and her pulse is 92/min and irregular. Abdomen is soft and mildly tender over the umbilical region. Bowel sounds are absent. She was noticed to pass a few episodes of passing dark (bloody) coloured motions during the day. Analysis of arterial blood gas reveals a pH of 7.24, bicarbonate of 20 and the base deficit to be -10.

From the options below choose the ONE that you think is the most likely diagnosis in this patient:

Sigmoid volvulus

Acute small bowel obstruction

Toxic megacolon

Leaking abdominal aortic aneurysm

Mesenteric infarction (Ischaemic bowel disease) ✔Correct answer

The history, signs and symptoms are classical of mesenteric infarction, also known as ischaemic bowel disease. The majority of the patients are elderly, and a significant number of them are found to be in atrial fibrillation. Clinical features of this condition vary with some patients being asymptomatic or manifesting minimal symptoms during the initial period of developing ischaemic

bowel; other patients may present with persistent and generalised abdominal pain. Vomiting may or may not be present. Some patients may present with shock, with the shock being out of proportion to the clinical symptoms. The ischemic bowel may shed the 'non-viable mucosa', which mixed with mucus, results in dark-coloured (also known as 'plum-coloured') stools. The inflammatory markers such as the white cell count and C-reactive protein may be elevated. Arterial blood gas analysis is a very useful investigation, which may reveal a metabolic acidosis. This condition is a surgical emergency as the patient rapidly become toxic and may die from septic shock unless the infarcted bowel ('dead gut') is removed.

61. A 24-year-old man is brought to the Accident and Emergency department after he was found unconscious outside a nightclub. On examination, his blood pressure is 118/84 mmHg, pulse rate is 92/min and GCS is 3. He smells heavily of alcohol. He is noted to have bilateral periorbital haematomas and bruising over the left mastoid process. There is discharge of blood, mixed with a thin fluid, from his left nostril and left ear. Otoloscopic examination of the left ear reveals blood behind the tympanic membrane.

From the options below choose the ONE that you think is the most likely diagnosis in this patient:

- Le Fort II fracture
- Basal skull fracture ✔ Correct answer
- Subdural haemorrhage
- Le Fort I fracture
- Subarachnoid bleed

This patient is most likely to have a basal skull fracture. Trauma, such as due to fall from heights and road traffic accidents, is the commonest cause of this type of fracture. Basal skull fractures commonly involve the roof of the orbits, the sphenoid bone and parts of the temporal bone. The classical signs and symptoms of basal skull fracture include, periorbital haematoma (Raccoon eyes), subconjunctival haemorrhage where the posterior margins cannot be seen, Battle's sign (post auricular bruising and blood behind the eardrum) (although this sign may take 24-48 hours to develop in some patients) and rhinorrhoea/otorrhoea (blood mixed with CSF which doesn't clot) (this is caused due to the damage to the cribriform plates). Some recognised complications of basal skull fracture include meningitis (especially following CSF rhinorrhoea), facial palsy, and isolated VI nerve palsy. CT scan is the investigation of choice for the diagnosis of suspected basal skull fracture (and of other serious head injuries). Indications for CT scan include: a GCS <13; unreliable history or examination due to alcohol and/or drug ingestion; loss of consciousness for >5 minutes; persisting/progressive headache; persistent vomiting; ante- and/or retrograde amnesia; clinical suspicion of basal skull fracture, and; skull fracture with neurological signs and/or convulsions.

Patients with GCS <8 have a risk of respiratory compromise and hence need to be intubated.

62. A nine-month-old baby boy is brought to the Paediatric Surgical Emergency unit by his parents with a 24-hour history of intermittent episodes of crying, vomiting and refusal to feed. The parents say that they have noticed the baby's stools to be mixed with blood. On examination, a 'sausage-shaped' mass is palpable over the right side of abdomen. Per rectal examination reveals an empty rectum but blood is noticed in the glove of the examining finger.

From the options below choose the ONE which you think is the most likely diagnosis in this patient:

- Intussusception ✔ Correct answer
- Infantile hypertrophic pyloric stenosis
- Duodenal atresia
- Meconium ileus
- Hirschsprung's disease

Intussusception is more common in boys and usually occurs under the age of one. It is associated with haemophilia, Henoch-Schönlein purpura, haemangiomas and GI lymphomas. Although the precise aetiology is not clear, intussusception is known to occur with greater frequency in children who have undergone recent abdominal surgery, either intraperitoneal or retroperitoneal operations. Intussusception is caused due to invagination of a segment of bowel into its adjoining lower segment. Mesentery and vessels may also become involved with the intraluminal loop and squeezed within the engulfing segment. Clinical features of this condition include severe colicky abdominal pain (causing intermittent inconsolable cries with the child drawing up the legs) and vomiting. Between attacks, the infant may appear in good health. The infant may pass 'redcurrant jelly' stool. Abdominal examination may reveal a 'sausage-shaped' mass and rectal examination may reveal blood.

63.

A 33-year-old cyclist is brought to the Accident and Emergency department after he was hit by a car travelling at about 40-50 mph on a dual carriage way. On examination, he has severe bruising over his left antero-lateral chest wall and there is a puncture wound at the level of left 6th ICS. There is decreased air entry over the left lower lobe of lung and bowel sounds are heard in the chest. A chest X-ray reveals fracture of the lower four ribs on the left side and a raised left dome of the diaphragm.

From the options below choose the ONE which you think is the most likely diagnosis in this patient:

- Tension pneumothorax
- Traumatic haemothorax
- Diaphragmatic rupture ✔ Correct answer
- Cardiac tamponade

The clinical signs and symptoms in this patient are most likely to be due to a ruptured diaphragm. Direct penetrating injury to the thoraco-abdominal region is a common cause for diaphragmatic rupture. The injury could be at any level between the 4th and the 10th inter-costal space, depending on the patient's respiratory pattern. The other causes include rib fractures and a sudden increase in thoraco-abdominal pressure, as occurs when the patient with a closed glottis is hit in the abdomen. Patients with rupture of the diaphragm may be present with hypotension, tachycardia, tachypnoea, chest pain and decreased air-entry in the lung base of the affected side. However, diaphragmatic rupture may be difficult to detect clinically, and thus may result in significant morbidity or sometimes mortality. Rupture may be seen on plain chest radiograph especially with the abnormal location of the naso-gastric tube; the accuracy of this method, however, is modest. Fracture(s) of the lower ribs on the affected side may or may not be present. The differential diagnoses for a raised left hemidiaphragm, both clinically and in plain radiography, includes, phrenic nerve palsy, atelectasis, diaphragmatic hernia and distended abdominal viscera.

64. A six-year-old boy is brought to the Accident and Emergency department with a 12-hour history of vomiting, severe abdominal pain and being generally unwell. His parents say that he also had two episodes of convulsions during this period. On examination, he appears pale and dehydrated. The abdomen is rigid and tender, and his pain is worse over the right iliac fossa. His temperature is 40.2° C, blood pressure 82/64 mmHg, and pulse rate 172/min. There is no discoloration over the anterior abdominal wall. Bowel sounds are absent.

From the options below choose the ONE which you think is the most likely diagnosis in this child:

- Necrotising enterocolitis
- Acute appendicitis
- Volvulus neonatorum
- Meckel's diverticulitis
- Bacterial Peritonitis ✔ Correct answer

The signs and symptoms in this child are suggestive of spreading/established infection in the peritoneal cavity. Bacterial peritonitis in children may occur as a result of a ruptured viscus such as ruptured appendicitis or ruptured Meckel's diverticulitis, or as a complication of abdominal surgery. The child may present with classical signs of peritonitis such as abdominal pain, pyrexia, nausea, vomiting, tachycardia, low blood pressure and decreased urine output. High pyrexia may result in febrile convulsions. Abdominal examination may reveal a board-like rigidity, guarding and rebound tenderness. Bowel sounds are absent if the peritonitis becomes established. Plain abdominal X-rays should be performed in both supine and upright positions to identify the presence of free gas beneath the diaphragm, which suggests perforation of a viscus. The common organisms responsible for bacterial peritonitis in children include Escherichia coli, Klebsiella pneumoniae and pseudomonas species.

65. A 74-year-old gentleman presents to his General Practitioner with a four-month history of vague lower abdominal pain, abdominal distension and absolute constipation. On further questioning he says that he has noticed a change in his bowel habits, a sense of incomplete evacuation of the bowel and his stools to be mixed with blood. He has lost more than a stone in weight during this period. On examination, the abdomen is soft but a mass is felt over the left iliac fossa. Plain abdominal X-ray reveals a markedly dilated colon.

From the options below choose the ONE that you think is the most likely diagnosis in this patient:

- Toxic megacolon
- Acute colonic pseudo-obstruction
- Sigmoid volvulus
- Colonic carcinoma ✔ Correct answer
- Diverticular disease

Elderly patients with per rectal bleeding, change in bowel habits, and weight loss should be considered to have colonic cancer unless proven otherwise. Increase in age is a risk factor for developing colonic cancer. The other risk factors, among others, include a family history of colon cancer, familial adenomatous polyposis, diet rich in red meat and long standing ulcerative

colitis or Crohn's disease. The clinical presentation of patients with colonic malignancy depends on the site of the tumour. Right-sided colonic carcinoma commonly presents with anaemia, tiredness, malaise, pallor and loss of weight, while the left sided colonic carcinoma presents with change in the bowel habits, bleeding per rectum and intestinal obstruction. Rectal carcinoma, in addition to the features seen in left-sided colonic carcinoma, is associated with a sense of incomplete evacuation of the bowel (tenesmus). Investigations for suspected colonic malignancy includes full blood cell count, renal function and electrolytes, liver function tests (to rule out hepatic involvement), plain X-ray of the abdomen, and ultrasound and CT scans. Carcinoembryonic antigen (CEA) is the commonly used tumour marker to diagnose colonic malignancy and subsequently to assess the progress, including recurrence.

66.

A 33-year-old company executive presents to his General Practitioner with a six-week history of upper abdominal pain and diarrhoea. He also says that he has had a few episodes of 'dark-coloured' vomitus during this period. General examination is unremarkable. Endoscopic examination of his upper gastro-intestinal region reveals multiple ulcers in the stomach and duodenum.

From the options below choose the ONE that you think is the most likely diagnosis in this patient:

- Carcinoid tumour
- Gastrinoma ✔ Correct answer
- Somatostatinoma
- Vasoactive intestinal peptide tumour
- ACTH secreting tumour

Gastrinomas, which occur primarily in the pancreas and duodenum, are malignant in nearly two-thirds of cases. The patients may present with upper abdominal/epigastric pain and vomiting; the vomitus may be 'coffee-ground' due to bleeding from the ulcers. Ninety percent of patients with gastrinomas develop peptic ulceration. Gastrinomas may either arise sporadically or as part of Zollinger-Ellison syndrome (peptic ulceration, gastric acid hypersecretion and islet cell tumour of the pancreas). Sporadic Zollinger-Ellison occurs most frequently in the fifth decade of life. Approximately 20% of patients with Zollinger-Ellison syndrome have MEN type I syndrome. An elevated basal gastric acid output >15mEq/h and a serum gastrin >1000pg/ml are suggestive of a gastrinoma. If it is difficult to make a diagnosis, a secretin stimulation test may be indicated. Lesions are localised by somatostatin-receptor scintigraphy. A CT scan may be indicated to exclude metastases. The treatment of this condition is either conservative (high dose proton pump inhibitors) or surgical. Surgical resection may be aided by intra-operative ultrasound and/or intra-operative endoscopy.

67. A 34-year-old lorry driver presents to his General Practitioner with altered sensation over the medial aspect of his right hand, and reduced hand function. He had sustained a fracture of the medial epicondyle of the right humerus three months ago. On examination, there is wasting of muscles over the hypothenar eminence with loss abduction and adduction of the fingers.

From the options below choose the ONE nerve that you think is most likely to be injured in this patient:

- Radial nerve
- Ulnar nerve ✔ Correct answer
- Median nerve
- Musculocutaneous nerve
- Posterior interosseous nerve

Ulnar nerve (C8, T1) arises from the medial cord of the brachial plexus or, more specifically, the anterior division of the lower trunk. This nerve is commonly damaged following injury to the medial epicondyle of the humerus. It can also be injured in other types of humeral fractures. Ulnar nerve injury may lead to paralysis of the small muscles of the hand; paralysis of the interossei results in loss of adduction and abduction of the fingers. Thumb adduction may be lost due to loss of innervation of adductor pollicis brevis (the other thenar muscles are supplied by the median nerve). **Clawing of the little and ring fingers, known as the 'ulnar claw hand', is seen in low ulnar nerve injuries where the extension of the fingers is lost due to paralysis of the medial two lumbricals but the fingers become flexed due to the unopposed action of the long flexors (flexor digitorum superficialis and flexor digitorum profundus). High ulnar nerve lesions cause loss of action of the above flexors to the little and ring fingers and hence there is no clawing of the hand.**

68. A 54-year-old gentleman presents to the Accident and Emergency department with a six-hour history of severe epigastric and central abdominal pain radiating through to his back. The pain reduces when he sits forward. He has also had three episodes of vomiting, mostly bilious. He admits to drinking up to 40-50 units of alcohol per week. He has experienced similar episodes in the past but less severe. On examination, his pulse rate is 94/min and respiratory rate is 18/min. Abdominal examination reveals that he is very tender over the epigastric region with moderate degree of guarding but no evidence of peritoneal irritation. Plain radiographs of the chest (erect) and abdomen (supine) are unremarkable.

From the options below choose the ONE that you think is the most likely diagnosis in this patient:

- Intestinal obstruction
- Mesenteric ischaemia
- Acute pancreatitis ✔ Correct answer
- Perforated peptic ulcer
- Ruptured abdominal aortic aneurysm

The signs and symptoms in this patient are very suggestive of acute pancreatitis. Alcohol accounts for about 30-35% of all cases of acute pancreatitis. The other important cause is obstruction secondary to gallstones (30-40%). Approximately 25% of patients presenting with acute pancreatitis may have associated cardiovascular (tachycardia) or respiratory (tachypnoea) symptoms. Pancreatitis is thought to result from early activation of pancreatic enzymes, producing auto-digestion of the pancreas and surrounding tissues. The severity of acute pancreatitis is validated using various prognostic scoring systems. Currently in the UK, the Glasgow-Imrie scoring system is widely used for assessing the severity and predicating the prognosis in acute pancreatitis (age > 55 years, white blood cell count > $15 \times 10^9/l$, glucose > 10 mmol/l, urea > 16 mmol/l, $PaO_2 < 60$ mm Hg, calcium < 2 mmol/l, albumin < 32 g/l, lactate dehydrogenase > 600 units/l, aspartate/alanine aminotransferase > 100 units/l. Serum C-reactive protein concentration, although not part of the Glasgow criteria, has an independent prognostic value if the peak level is > 210 mg/l in the first four days of the attack). Serum amylase is a useful indicator to diagnose acute pancreatitis; a diagnosis of acute pancreatitis is likely if the level is three times the upper limit of normal although this may vary between laboratories depending on the hospital policy/guidelines. An ultrasound of the abdomen is indicated in all patients with acute pancreatitis to determine the presence/absence of biliary calculi. A CT of the abdomen should be performed on all patients with severe acute pancreatitis between the third and tenth days following the onset of symptoms to rule out pancreatic necrosis.

69. A 26-year-old motorcyclist is brought to the Accident and Emergency department after he was involved in a high-speed road traffic accident. He complains of pain over the left side of his chest and feels short of breath. On examination, his pulse rate is 120/min, blood pressure is 98/66 mmHg and his respiratory rate is 22/min. His jugular venous pressure is elevated. Heart sounds are muffled. Trachea is central and breath sounds are normal bilaterally. A chest radiograph reveals fractures of the 5th, 6th and 7th ribs on the left side. The cardiac silhouette is enlarged.

From the options below choose the ONE which you think is the most likely diagnosis in this patient:

- Tension pneumothorax
- Ruptured thoracic aorta
- Cardiac tamponade ✔ Correct answer
- Flail chest
- Pericarditis

Cardiac tamponade is usually caused by direct penetrating injury to the heart. It can also result from blunt injuries to the heart which causes injury to the pericardial vessels or high velocity injuries to the great vessels (e.g., thoracic aorta) which results in pooling of blood in the pericardium. Apart from trauma, cardiac tamponade can result from carcinomas of the breast or lung, dissecting thoracic aneurysm, myocardial infarctions, and bacterial, viral or tuberculous pericarditis. Cardiac tamponade can be difficult to diagnose clinically, especially in an Accident and Emergency department. The classic (and diagnostic) signs of cardiac tamponade include a triad of (Beck's triad) falling blood pressure, rising jugular venous pulse and muffled heart sounds. Pulsus paradoxus may also be an associated finding. The jugular venous pulse may paradoxically rise with inspiration (Kussmaul's sign). Chest radiograph may reveal a globular heart, a convex or straight left heart border, and a right cardiophrenic angle of < 90°. Plain chest X-ray, ECG, echocardiography and diagnostic pericardiocentesis are the commonly used investigations to diagnose cardiac tamponade.

70. A 58-year-old man is brought to the Accident and Emergency department after he was struck by a van in a 'hit and run' incident on a country road. On examination, he appears restless and is short of breath. His blood pressure is 108/76 mmHg, pulse rate is 118/min, respiratory rate is 22/min and oxygen saturation is 88% on 100% oxygen by face mask. On examination of his chest, the trachea is pushed to the left, the right lung is hyper-resonant to percuss, and there is reduced air-entry in the lung fields on the right side.

From the options below choose the ONE which you think is the most likely diagnosis in this patient:

- Pulmonary embolism
- Tension pneumothorax ✔ Correct answer

- Diaphragmatic rupture
- Ruptured right main stem bronchus
- Pulmonary contusion

Blunt or penetrating trauma to the chest is the commonest cause for a tension pneumothorax. Other causes include, barotrauma secondary to positive-pressure ventilation (especially when using high amounts of positive end-expiratory pressure), central venous catheter placement, chest compressions during cardiopulmonary resuscitation, fibre-optic bronchoscopy with closed-lung biopsy and markedly displaced thoracic spine fractures. A tension pneumothorax results from any lung parenchymal or bronchial injury that acts as a one-way valve, allowing free air to move into an intact pleural space but prevents free exit of that air. The increased volume of air in the pleural space causes the lung on the affected side to collapse and eventually causes the mediastinum to shift to the contralateral side. The shifted mediastinum impinges on, and compresses the contralateral lung, and also impairs venous return. The clinical signs and symptoms of this condition include sudden onset of severe chest pain, tightness of chest, breathing difficulty, distended neck veins, cyanosis, tachycardia and decreased mental alertness. The trachea and mediastinal structures are shifted to the contralateral side. The affected lung is hyperresonant to percuss and there is usually reduced air-entry on that side.