Genetics Questions:

These questions are aimed at medical and allied health professionals and they are designed to show where genetics has a role in clinical practice.

There are 15 questions in total

The answers can be found on the accompanying document

A grid designed to assist navigation through the questions and answers is also available as a separate accompanying document.

Virtual Genetics Education Centre: http://www.le.ac.uk/ge/genie/vgec/index.html
Cystic fibrosis: Sibling carrier risk.

Carol and Frank present to you at 10 weeks gestation. Carol’s brother has cystic fibrosis and the couple have come to you as they are concerned that their baby may inherit the disease.

What mode of inheritance does CF have?
What is the risk of Carol being a carrier?
What is the risk of Frank being a carrier?
What is the risk of the baby being affected by the condition?
What proportion of genes do we share with our first cousin?
What is the risk of a recessive condition in first cousin marriages?
Breast Lump

Barbara is a 36 year old lady who presents with a breast lump. Her mother had ovarian cancer at the age of 43 and a maternal aunt had breast cancer at the age of 40. Barbara has heard that some breast cancer can run in families and as she has Jewish ancestry, she was wondering if this might be the case in her family.

Is there likely to be a genetic inherited component to this pedigree?

Which genes could be involved / responsible?

Is the Jewish ancestry likely to be relevant?

What is the likelihood of this lady being a mutation carrier?

What factors need to be taken into consideration to calculate the risk of this lady developing breast cancer?
Joint Pain

Harry is a 43 year old man who presents with joint pains. He is a diabetic and was treated for erectile dysfunction last year. He appears tanned. His sister is currently being investigated for cirrhosis.

What are the secondary causes of osteoarthritis?

What are the secondary causes of diabetes?

What are the secondary causes of cirrhosis?

What are the causes of tanned skin without sun exposure?

What is the most likely underlying diagnosis given his sister’s cirrhosis?

Which chemical pathology tests would you recommend?

What is the most likely gene mutation associated with this condition?

What is the mode of inheritance in this condition?
Recurrent Miscarriage

A 32 year old woman and her partner present with recurrent miscarriages. She has had four confirmed pregnancies with miscarriages between 6-10 weeks. Her mother also had two miscarriages. The maternal sister has profound learning difficulties.

What is the definition of recurrent miscarriage?

What are the causes of recurrent miscarriages?

Given the maternal sisters learning difficulties what is the most likely underlying diagnosis?

What investigations would you recommend?

What can be done to reduce the risk of further miscarriages or birth of a child with learning difficulties?
Collapse

A 25 year old man presents to accident and emergency on a Saturday afternoon after collapsing while playing basketball. He has sharp central chest pain, a weak left radial pulse and a mild pectus excavatum. His grandfather died from a suspected heart attack while pushing his car in Africa last year.

What other examination points might help to confirm a genetic cause for his current problem?

What is the cause of the weak left radial pulse?

What is the pattern of inheritance for this condition?

Which gene is affected and on which chromosome is it?

What is the main differential for this condition and how might you distinguish the two conditions?
Question Six

Acne

A 22 year old woman makes an appointment at the GPs to discuss her acne. She has also noticed that light patches have appeared on her arm after a recent holiday in Spain. She has a history of epilepsy. Her mother has recently been diagnosed with a renal cell carcinoma.

What is the underlying diagnosis?

What is the cause of her facial rash?

How would you examine her skin more closely?

What screening would you recommend?
Question Seven

A 12 year old boy

A 12 year old boy is taken to see the paediatric endocrinologist because of obesity, abdominal discomfort and poor behaviour. His father previously had kidney stones and his older sister is being investigated for galactorrhoea.

What are the causes of galactorrhoea in a women with no history of previous pregnancy?

What are the causes of kidney stones?

Which abdominal tumour can cause increased appetite and poor behaviour?

Which syndrome can link all of these things?
Drink driving?

A 42 year old man is brought into accident and emergency by the police after being arrested for drink driving. No alcohol was detected on a breath test. He has slurred speech and appears uncoordinated. His wife had left him after he was diagnosed with depression. His father died from dementia at the age of 53.

What are the causes of chorea?

What are the organic causes of depression?

What are the causes of pre-senile dementia?

What are the autosomal dominant causes of chorea and dementia?

What is the likely diagnosis?
Question Nine

Hypocalcaemia

A baby in the neonatal ward with a cleft palate starts to fit. The calcium is noted to be low. The father has recently been discharged from a psychiatric hospital with schizophrenia.

What are the causes of neonatal hypocalcaemia?

What are the syndromic causes of a cleft palate?

Which cytogenetic abnormality may be found in bipolar disorders and schizophrenia?

What is the most likely diagnosis?
Cataracts

A 36 year old diabetic is seen in the ophthalmology clinic with cataracts. He complains that he finds it difficult moving his hands after carrying bags in cold weather. His mother is in a wheelchair with a muscular dystrophy.

Which disease links cataracts, diabetes and autosomal dominant muscular dystrophy?

Why might this patient be presenting with symptoms earlier than his father?

What should this patient be told about any hospital admissions?
Question Eleven

Multiple fractures

A two year old child is brought into the fracture clinic with a fracture of the right radius and ulna. Other older fractures have also been observed. The mother claims she had numerous fractures due to horse riding as a teenager. On examination her sclerae are blue and teeth enamel is poor.

What are the causes of multiple fractures of different ages?

What conditions can cause blue sclera?

What makes the sclera blue?

Is the poor enamel linked to the other signs?

How is this condition inherited?

What tests could help make a diagnosis?
Prenatal diagnosis

A 24 year old woman is eight weeks pregnant. Her maternal uncle died of a ‘progressive muscle wasting disease’ in his twenties. She brings a death certificate stating her uncle died of Duchenne Muscular Dystrophy (DMD). Her mother has a cardiomyopathy and does not want to know if she is a carrier.

What features in the history suggest that DMD is the correct diagnosis?

Give three investigations which can help confirm a diagnosis of DMD?

What is the risk of the baby developing this condition?
Question Thirteen

A visit to the neonatal ward

You go to see a baby on the neonatal ward with seizures. The baby has macroglossia and asymmetry and weighs 4.5kg.

What are the causes of increased birth weight?

What are the causes of macroglossia?

What are the causes of asymmetry?

What quick bedside test would aid diagnosis and treatment?

What is the genetic differential for asymmetry?

What other features can be associated with body asymmetry?

Which screening tests should be offered?
Question Fourteen

Polyuria, Polydipsia and Tiredness

Mary, a 43 year old woman presents with polyuria, polydipsia and constant tiredness. Her sister, Anne, has hearing loss of unknown type and her mother, Iris, died from a diabetic coma at the age of 50.

What is the possible unifying diagnosis?

What is the inheritance pattern of this condition?

What chemicopathological test would aid the diagnosis?

Name at least three causes of pancreatitis other than alcohol.
Question Fifteen

Alpha 1 antitrypsin deficiency

A 45 year old man visits his GP. His newborn daughter has been diagnosed with alpha 1 antitrypsin deficiency after developing severe neonatal jaundice and breathing difficulties. He wants to continue smoking and has been advised by the respiratory physicians that he should have a carrier test.

Is the risk of emphysema increased in mutation carriers of the MZ alpha-1-antitrypsin mutation?

Is the risk altered by smoking?

If carrier testing shows this man to be normal MM what are the possible reasons for this? How would you broach these possibilities?