1. Many hormones are created from cholesterol. Name 4 of these (2 marks)
(0.5 mark each, max 2 marks) : progesterone, DHEA, Androstenedione, cortisol, aldosterone, testosterone, oestrogen etc..

2a). A science teacher, Louise 28 years old, comes to see you with urgency and frequency to urinate, dysuria, cloudy and offensive-smelling urine, and suprapubic discomfort. What is Louise most likely to be suffering from? (1 mark)
Cystitis (1 mark)

2b). Louise has had a confirmation from her doctor that this diagnosis is correct. She has heard that taking Cranberry can help, she would like to know in detail why it may be beneficial. (4 marks)
Benzoic acid (0.5 marks) and quinic acid (0.5 marks) metabolise to hippuric acid (1 mark) which may prevent bacteria from adhering to the epithelial cells of the bladder. (1 mark) Proanthocyanidins in cranberry seem to envelop E. coli and prevents it from binding to epithelial cells. (1 mark)

3a). Which enzyme converts testosterone and adrenal androstenedione into oestrogens? (1 mark)
Aromatase (1 mark)

3b). The levels of this enzyme are increased for numerous reasons. Give 3 reasons for increased levels (3 marks)
(1 mark each, max 3 marks) Aromatase levels increase due to: Increased age, increased fat mass, increased insulin, increased alcohol intake, increased prostaglandin levels, increased cytokines, increased growth factors

4. Complete the following table. Please note there are more answers than required and answers can be used more than once. (5 marks)

<table>
<thead>
<tr>
<th>Nutrient</th>
<th>Useful for:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tyrosine</td>
<td></td>
</tr>
<tr>
<td>Iodine</td>
<td></td>
</tr>
<tr>
<td>Zinc</td>
<td></td>
</tr>
<tr>
<td>Selenium</td>
<td></td>
</tr>
<tr>
<td>Copper</td>
<td></td>
</tr>
</tbody>
</table>

a) Required for thyroid hormone synthesis, activation and metabolism,
b) Inhibits conversion of T4 into rT3,
c) Required for thyroid hormone formation,  
d) Required for conversion of T4 to T3

Answer (1 mark per correct answer)

<table>
<thead>
<tr>
<th>Nutrient</th>
<th>Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tyrosine</td>
<td>C - required for thyroid hormone formation</td>
</tr>
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<td>Iodine</td>
<td>C - required for thyroid hormone formation</td>
</tr>
<tr>
<td>Zinc</td>
<td>D - conversion of T4 to T3</td>
</tr>
<tr>
<td>Selenium</td>
<td>A - thyroid hormone synthesis, activation, and metabolism</td>
</tr>
<tr>
<td>Copper</td>
<td>D - conversion of T4 to T3</td>
</tr>
</tbody>
</table>

5. Alanna 35 years old comes to see you as she is newly pregnant. She would like your advice on how to eat healthily during her pregnancy. Please explain the following to Alanna:

5a) How many extra calories do you need per day during pregnancy? (1 mark)
100-300 kcal/day (1 mark)

5b) How much extra protein should be added into the diet of a pregnant woman per day? (1 mark)
6-10g/day (1 mark)

5c) List 4 foods Alanna should avoid during pregnancy (2 marks)
(0.5 mark each, max 2 marks): raw eggs, mousse, mayonnaise, unpasteurised dairy, goats or sheeps milk/cheese contaminated water, uncooked meat, preprepared meat slices, parma ham, salami.

5d) Recommend 3 things Alanna can do to combat the symptoms of Hyperemesis gravidarum (morning sickness) (3 marks)
(1 mark each, max 3 marks) Frequent small meals, take B6, drink ginger or peppermint tea, eat before getting out of bed, homeopathic nux vomica/ipecac

5e) Alanna tells you she constantly wants to chew ice, and her older children’s charcoal. What is this phenomena called? What deficiency is indicated? (1 mark)
Pica (0.5 mark) Iron (0.5 mark)

6. Carbohydrate loading increases power, strength, VO2 max or maximum aerobic output - it simply enables an athlete to continue for longer at their maximum aerobic pace. True or false? (1 mark)
False (1 mark)

7. Carbohydrate loading is excellent for events under two hours. True or false? (1 mark)
False (1 mark)

8. Bob has come to see you as he is suffering from osteoarthritis. Describe in detail two different aspects of why taking glucosamine sulphate could be beneficial for Bob. (4 marks)
Any of the below to a maximum of 4 marks
• Glucosamine is the fundamental building block required for the synthesis of glycolipids, glycoproteins, glycosaminoglycans (GAGs) (1 mark) and hyaluronate (1 mark)
• Is a provider of sulphate ions (1 mark) for the synthesis of the sulphated glycosaminoglycan (1 mark)
• Glucosamine stimulates chondrocytes to synthesise proteoglycans (1 mark) and collagen. (1 mark)
• Glucosamine inhibits certain enzymes (1 mark) such as collagenase and phospholipase, which destroy cartilage. (1 mark)

9. The Swank Diet (low in saturated fat) has been known to halt the disease process of Multiple Sclerosis (MS). Name 2 other nutrients which are also helpful to MS patients. Explain why they are beneficial. (4 marks)
B12 (1 mark) – demyelination, remyelination and repair in multiple sclerosis, MS patients are often deficient. (1 mark)
Vitamin D (1 mark) – MS is an autoimmune disease. Vit D is an immune modulator. (1 mark)

10. DHEA is a hormone which declines with age and is one of the key hormones involved in the neuro-endocrine theory of ageing. Describe 4 positive functions of this hormone. (4 marks)
• (1 mark each, max 4 marks) Functions of DHEA
  - Stimulates and strengthens the immune system by improving resistance to microbes, allergies and cancer - blunts the suppressive effect caused by excessive cortisol.
  - Improves metabolism by aiding efficient conversion of proteins, carbohydrates and fats to energy. This in turn can reduce fat storage.
  - Aids dietary protein synthesis helping mood, optimum wellness and reducing food intolerances.
  - Helps prevent osteoporosis
  - Lowers LDL cholesterol levels
  - Decreases PMS and menstrual difficulties
  - Decreases cravings
  - Appears to slow down the natural aging process of cells and organs

11. Discuss 3 possible causes of Polycystic Ovarian Syndrome (PCOS) explaining each in detail. (6 marks)
• (1 mark for the cause and 1 mark for the explanation, max 6 marks)
  - Insulin resistance - through complex metabolic pathways, elevated insulin levels lead to increased ovarian androgens, increased adrenal androgens, increased triglycerides and decreased HDL cholesterol.
  - Ovarian dysfunction - very low oestradiol and very high ovarian androgens lead to elevated acyclic oestrogen (oestrone) which potentiate the development of numerous immature cystic follicles. This in turn perpetuates elevated LH (luteinising hormone) and lowered FSH (follicle stimulating hormone) levels.
  - Excess weight gain - an increase in fatty tissue leads to the conversion of androgens to oestrone (aromatisation) which increases the levels of the non - variable oestrogens (it has been suggested that marked weight gain can trigger PCOS in some individuals).
- Adrenal dysfunction - excessive adrenal production of androgens leads to elevated oestrones.
- Hypothalamic - pituitary axis dysfunction: inappropriate GnRH (gonadotropin releasing hormone) release leads to elevated LH and lowered FSH.
- Genetic predisposition - it has been shown that PCOS may be inherited. Approximately 40% of the women with a family history of PCOS will have the condition. However not all of these will develop symptoms.
- Leptin regulation - this is a hormone secreted by the adipocytes that regulates body weight. Its full role in PCOS is yet to be ascertained.

12. What type of premenstrual tension is PMT-H? Give advice for a client suffering from PMT-H in regards to their sodium and potassium intake, and why would they likely benefit from vitamin B6? (3 marks)

- Premenstrual tension – Hyper hydration (1 mark).
- Reduce sodium (0.5) and increase potassium (0.5) foods,
- Vitamin B6 to help regulate aldosterone (1 mark)

13. Mary brings her 6 year old son Max into see you as he suffers from asthma. During the consult you realise that Mary is obsessed with keeping Max and his environment clean. Explain the Hygiene Hypothesis to Mary and its impact on asthma. (5 marks)

- Excessive use of cleaning agents at home and spending less time outside playing in the earth/grass is depriving the immune system of its ‘learning tools’ against various antigens in early life (1 mark) Natural antigens stimulate Th1 response (1 mark) Asthma and atopic conditions like allergies reflect increased response of Th2 helper cells (1 mark). The “hygiene hypothesis” minimizes exposure to infectious agents due to more hygienic lifestyle choices has favoured the dominance of Th2 immune responses (1 mark) and the encouragement of asthma and atopic diseases (1 mark).

14. Please circle the most correct statement:
- A) Insulin levels decrease fibre content
- B) High fats increases insulin action
- C) High animal protein increases insulin levels
- D) High refined carbohydrates decrease insulin levels

Answer:C (1 mark)

15. What are 4 signs or symptoms of a child suffering from Attention Deficit/hyperactivity disorder (ADHD) (2 marks)
(0.5 mark each, max 2 marks) Hyperactivity, Perceptual motor impairment, Emotional liability, General coordination deficit, Short attention span/distractibility, Listening problems, Poor concentration, Impulsiveness, Disorders of memory and thinking, Specific learning disabilities, Lack of perseverence, Failure to finish projects, Equivocal neurological signs and electroencephalographic irregularities

16. Describe in detail the effect of stress on T4 to T3 conversion. What type of symptoms would a person present with who had conversion issues? (3 marks)
Physical, mental and environmental stresses can inhibit the deiodinating enzyme, causing less T4 to be converted to T3 (1 mark). More T4 is then shunted towards reverse T3 (rT3) causing an elevation in rT3 (1 mark) When a patient produces excessive levels of rT3 they will usually present with hypothyroid symptoms (1 mark)

17. Jim comes to see you as he has previously suffered from calcium oxalate kidney stones. Name 3 vegetables foods high in oxalates. (3 marks)
   - (1 mark each, max 3 marks) spinach, Swiss chard, beet greens, collards, okra, parsley, leeks

18. Certain bacteria and viruses have been implicated in cancer. Please complete the following table. Please note there are more answers than required. (4 marks)

<table>
<thead>
<tr>
<th>Virus/Bacteria</th>
<th>Implicated Cancer</th>
</tr>
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<tbody>
<tr>
<td>Non Hodgkins Lymphoma</td>
<td></td>
</tr>
<tr>
<td>Kaposi Sarcoma</td>
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</tr>
<tr>
<td>Gastric Cancer</td>
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</tr>
<tr>
<td>Carcinomas of the vulva, perineum, uterus, cervix and anus</td>
<td></td>
</tr>
</tbody>
</table>

   • Cytomegalovirus, Herpes virus, Papilloma virus, Retro virus, Epstein Barr Virus, Helicobacter pylori

   1 mark each correct answer

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19. Research suggests that aluminum based compounds (found in deodorants) may contribute to the development of breast cancer. Explain. (3 marks)
   • Aluminum in deodorants form a temporary plug within the sweat duct that stops the flow of sweat to the skin’s surface. (1 mark) They may be absorbed by the skin and cause oestrogen like (hormonal) effects (1 mark). Because oestrogen has the ability to promote the growth of cancer cells within the breast, some scientists have suggested that the aluminum-based compounds in antiperspirants may contribute to the development of breast cancer (1 mark)

20a. Which enzyme is responsible for excessive uric acid build up in gout? (1 mark)
   Xanthine oxidase (1 mark)

20b. Name 2 nutrients that may inhibit this enzyme. (2 marks)
   Folic acid (1 marks) Quercetin (1 mark)

21. Alexandra 32 years old comes to see you as she is having trouble breast feeding. Explain in detail how stress affects milk supply in regards to the dopamine-prolactin axis? (3 marks)
Milk production is responsive to maternal states of wellbeing. Thus, stress and fatigue adversely affect a woman's milk supply. (1 mark) The mechanism for this effect is the down-regulation of milk synthesis with increased levels of dopamine (and to a lesser extent norepinephrine) (1 mark) which inhibit prolactin synthesis. (1 mark)

22. Explain 3 differences between phosphate energy system and the lactate energy system. (6 marks)
(1 mark each difference, max 6 marks)

<table>
<thead>
<tr>
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<th>Lactate Energy System</th>
</tr>
</thead>
<tbody>
<tr>
<td>Uses phosphocreatine as fuel</td>
<td>Uses stored muscle glycogen &amp; serum glucose</td>
</tr>
<tr>
<td>Used in burst of speed up to 6 secs</td>
<td>95% intensity lasts 30sec/60% intensity lasts 30mins</td>
</tr>
<tr>
<td>Produces no waste products</td>
<td>Produces lactic acid as waste product</td>
</tr>
<tr>
<td>Full Recovery takes 2 mins</td>
<td>Full recovery takes 2 hours</td>
</tr>
</tbody>
</table>

Case study: Pam

Aged: 58 years
Height: 167cm
Weight: 120kg
Occupation: Personal assistant
Martial Status: divorced 12 years ago, is now seeing someone casually
Children: 2 x girls 18 & 23yrs old

Prescription medication:
- Ibuprofen – 400mg taken 2x day
- Metformin – 500mg 2x day

Supplements: Calcium citrate 150mg/day. Centrum multivitamin when she remembers

Presenting symptoms: Pam comes to see you as she is suffering from osteoarthritis in her left knee. She has pain pretty much constantly, which is manageable when taking ibuprofen. Pain is worse with movement and relieved when she stops (although the more she stays in one place, the harder it is to get moving). She was diagnosed 18months ago. Pam is also a type 2 diabetic, diagnosed 10 years ago. Pam still suffers from general fatigue, polyuria and blurred vision on a daily basis but feel this is just something she “has to live with”.

Medical history: Tonsillitis, ear infections as a child, left knee injury at 21yrs playing hockey, she has been overweight for the last 10 years since her divorce.

Family history: Her paternal grandmother had diabetes, cardiovascular disease. Her mother and her maternal mother both suffered from osteoarthritis.

Diet:
Breakfast: toast and honey with a banana or nothing if she is late.
Snack (morning): Tea with milk and sweetener, a few biscuits at her desk
Lunch: prêt sandwich (cheese, ham, pickle or tuna and mayo) with fresh lemonade and an apple

Snacks (afternoon): crisps and a chocolate bar, more tea, some water

Dinner: chicken, turkey, beef or lamb with pasta, potatoes, white rice and vegetables (carrot, peas, broccoli, cauliflower)

Dessert: She always has pudding - ice cream with sticky toffee pudding is her favourite

Drinks & Alcohol: 1x large (250ml) glass of red wine a night and more on weekends. Water about 500-750ml/day, 3-4 teas (milk and sweetener), 1-2 coffees (milk and sweetener)

System review:

Nervous system: Pam has a stressful job and works long hours for her boss. She drags herself out of bed at 6:30am and is in the office at 8:30am. She generally works until 6-7pm at night. She is tired practically all the time so she gets into bed about 10pm. She sleeps soundly (waking only to urinate) but she wakes up tired. Pam rates her current stress levels as being a 7/10 (10 = worst).

Digestive system: Pam suffers from some constipation and has to strain to pass a stool every 2 days. When she does, her stools are dark brown, very hard and in the shape of small pellets. She sometimes notices a little bit of bright red blood on the toilet paper when she wipes. She experiences lower abdominal pain and cramping just before passing a motion, but this is relieved after defecation. She is convinced her daily coffees help move her bowels along.

Endocrine system: Pam gets moody when she hasn’t eaten so she makes sure she eats regularly. She says her coffees and biscuits at break time help keep her going. She describes her current energy levels as 6/10.

Female Reproductive System: Pam went through menopause 6 years ago and currently does not display any ongoing symptoms, although she sometimes finds sex painful due to vaginal dryness

Musculoskeletal system: Apart from her OA, Pam suffers often from tight neck and shoulder muscles and her lower back is sometimes a bit painful. Lately her right hip is also painful when she walks.

Urinary system: Pam urinates frequently and 3x at night.

Respiratory system: nothing to report.

Immune system: Pam often gets colds and her nose runs practically all winter.

Skin: Very dry skin and often gets candida infections in the folds of her skin.

Lifestyle: Although her job is stressful, Pam manages to spend time with her children and her boyfriend on weekends. Her favourite thing to do is to visit gastro pubs on the weekends and visit friends for lunch.

Other information: weight is gathered around her abdomen, hips and buttocks and on her upper shoulders. Her tongue quivered violently upon inspection.

Please answer the following 6 QUESTIONS

1. Give a naturopathic summary that includes:
   - the body systems under stress
   - the possible triggers and drivers/mediators

4 marks

the body systems under stress
- Musculoskeletal (must be mentioned)
- Endocrine (must be mentioned)
- Nervous system (must be mentioned)
- Digestive system
• Skin
• Urinary system

the possible triggers and drivers/mediators
• Divorce – gaining weight
• Stressful job
• Lack of exercise
• Age

Etc…

1b. Any red flags? 1 mark
• Blood on toilet paper

2. What are your therapeutic aims? 3 marks
Something like:
• Balance blood sugar levels
• Reduce Stress
• Support Musculoskeletal System
• Improve joint function & reduce pain and inflammation
• Encourage correct bowel elimination
• Support digestive function

3. State your dietary advice for the patient, explaining the reason for your suggestions. 4 marks
• Stimulate appetite by starting the day in lemon and warm water
• Encourage breakfast – oats/porridge/berries/fruit/nuts & seeds/eggs
• Increase Omega 3 foods – nuts/seeds/oily fish/healthy oils
• Increase glucosamine rich foods – seafood, fish
• Include ¼ tsp cinnamon into foods daily (monitor BSLs)
• Avoid salicylate, solanine and amine containing foods
• Increase hydration – to at least 2L/day
• Encourage protein with each meal to balance BSLs
• Increase bitter foods
• Increase leafy green vegetables,
• Try a more paleo diet or
• Reduce unrefined carbohydrates and increase whole-grains
• Encourage a low GI/GL diet
• Reduce alcohol intake
• Avoid crisps biscuits etc and snack on nuts/seeds/fruit instead
• Decrease coffee and tea intake and replace with herbal teas
• Increase soluble and insoluble fibre
• Reduce artificial sweeteners

Etc…

4. List 2 supplements you would initially recommend and the reason why you are suggesting them. 3 marks
• Glucosamine sulphate 1500mg – builds up glycosaminoglycans
• Chondroitin sulphate 500mg – provides building blocks for glycosaminoglycans
• Bromelain 200-400mg daily – anti inflam, antiox
• Omega 3s – anti inflam
• Vitamin E 400-800IUs - inhibits the activities of lysosomal enzymes and stimulates increased deposition of proteoglycans, antioxidant and membrane-stabilising
• Vitamin C - anabolic effect on cartilage; required for chondrocyte protein synthesis; enhances the stability of sulfated proteoglycans.
• Chromium 100-300mcg – part of glucose tolerance factor – WATCH BLOOD GLUCOSE LEVELS (must be mentioned)
• Alpha lipoic acid 600mg – lipid antioxidant, aids in glucose control – WATCH BLOOD GLUCOSE LEVELS (must be mentioned)
• Magnesium 200-1000mg – cofactor for glucose control
• Zinc 10-100mg – cofactor for glucose enzymes, immunity etc

Etc…

5. Give any lifestyle changes you would suggest for the patient, explaining the reason for your suggestions. 2 marks
• Exercise (must be mentioned) – but gentle exercise which will not worsen OA ie swimming, tai chi,
• Epsom salts baths, lavender essential oil
• Breathing techniques daily to increase O2 and release tension and stress from work.
• Coconut oil as a lubricant during sexual intercourse/ for skin candida

Etc…

6. What tests would you suggest this patient have done? Include both mainstream and naturopathic tests. Would you consider any referrals? 3 marks
• Monitor Blood pressure, Lipid profile and Homocysteine
• Send to GP for another GTT
• Consider GP and further referrals to check out pain in hip – further OA?
• Massage therapist, reflexologist, acupuncturist

Etc…