CLINICAL THERAPEUTICS I: ENDOCRINOLOGY

PHA-2TKY

Time allowed: 2 hours

Part ONE

Answer ALL questions. For each question, there is ONE correct answer. Use the answer grid provided for ALL your answers.

Part TWO

Answer THREE of the FOUR questions.

Use a SEPARATE answer book for EACH question in Part TWO.

Each question has the same value. The marks distribution is shown as a percentage for each section of each question. Answer all part of each of the individual questions you select.

The mark allocation for the paper is:
- Part ONE carries 40% of the total mark.
- Part TWO carries 60% of the total mark.

You are advised to spend approximately 50 minutes on Part ONE and 70 minutes on Part TWO.

The paper consists of 11 pages in total.

The following is provided: Multiple choice answer grid.

Dictionaries are not permitted in this examination.

Notes are not permitted in this examination.

Do not take this question paper out of the examinations room.

Do not turn over until you are told to do so by the Invigilator.
PART ONE

Answer ALL questions. For each question, there is ONE correct answer. Use the answer grid provided for ALL your answers.

1. With respect to the specificity of hormones, which ONE of the following is CORRECT?
   (A) Metabolism of the hormone in the target cell  
   (B) Transport of hormones by specific carrier proteins into the target cell  
   (C) Binding of hormones to specific carrier proteins in the plasma  
   (D) Binding of hormones to specific receptors on or in the target cell  
   (E) Direct secretion of hormones onto target organs

2. Which ONE of the following hormones is NOT involved in fuel metabolism?
   (A) Somatostatin  
   (B) Glucagon  
   (C) Parathyroid hormone  
   (D) Insulin  
   (E) Cortisol

3. With respect to Diabetes Mellitus (DM) which ONE of the following is INCORRECT?
   (A) Thiazide diuretics and corticosteroids are a known cause of drug induced diabetes  
   (B) Approximately 4% of the UK population have Type 2 DM  
   (C) In Type 1 DM about 50% of the \( \beta \) cells in the pancreas function normally  
   (D) World Health Organisation (WHO) definition of DM includes two separate venous fasting blood glucose levels of \( \geq 7 \text{ mmol} / \text{l} \)  
   (E) Diabetic retinopathy is the commonest cause of blindness in people age 30-65 years in the UK

4. Which ONE of the following is NOT a sign/symptom of hypoglycaemia?
   (A) Hyperkalaemia  
   (B) Perioral numbness and tingling  
   (C) Slurred speech  
   (D) Irritability  
   (E) Blood glucose \( \leq 4 \text{ mmol} / \text{l} \)
5. With respect to the administration and use of insulin which **ONE** of the following is **CORRECT**?

(A) The aim of insulin therapy is to treat hyperglycaemia without causing hypoglycaemia
(B) Needles used in the administration of insulin should not be used more than three times before exchanging for a new needle
(C) The fastest absorption of insulin is achieved by injecting into the buttocks
(D) Twice daily insulin regimes allow flexibility with respect to timing of meals
(E) Disposable insulin pens should always be kept in the fridge

6. Which **ONE** of the following is a **CORRECT** description of the physico-chemical properties of insulin analogues compared to native insulin?

(A) Insulin Aspart: The exchange of proline for aspartic acid results in increased charge repulsion between the Insulin Aspart molecules compared to native insulin
(B) Insulin Aspart: The rate of diffusion of Insulin Aspart is less than that of native insulin
(C) Insulin Lispro: The repositioning of proline and lysine results in increased hydrophobic interactions between the Insulin Lispro molecules compared to native insulin
(D) Insulin Lispro: The rate of diffusion of Insulin Lispro is less than that of native insulin
(E) Insulin Glargine: The addition of two arginine residues on the B chain results in the Insulin Glargine showing a higher negative charge in solution than native insulin

7. Which **ONE** of the following is **NOT** an appropriate test or investigation to carry out in a patient with diabetes?

(A) HbA1c
(B) Cortisol levels
(C) Urine analysis for protein
(D) Blood pressure
(E) Lipid profile

8. Which **ONE** of the following statements is **INCORRECT** regarding the thiazolidinediones (e.g pioglitazone)?

(A) They increase glucose uptake into muscle cells
(B) They reduce insulin resistance
(C) They cause transcriptional changes in liver, adipose and skeletal muscle cells
(D) Their mechanism of action is via the nuclear receptor PPAR-gamma
(E) They act immediately to reduce blood glucose
9. Which **ONE** of the following is a side-effect of glibenclamide?

(A) Hypoglycaemia  
(B) Lactic acidosis  
(C) Hyperkalaemia (raised potassium levels)  
(D) Shortness of breath  
(E) Pruritis

10. Which **ONE** of the following is **INCORRECT** advice to a patient with diabetes with respect to the “sick day rules”?

(A) Do not stop taking insulin or tablets  
(B) Drink plenty of fluids  
(C) Test blood glucose once a day in the morning  
(D) Test urine for presence of ketones  
(E) Replace normal meals with carbohydrate containing drinks if necessary

11. Which **ONE** of the following is a macrovascular complication of diabetes mellitus?

(A) Erectile dysfunction  
(B) Cardiovascular disease  
(C) Foot ulcers  
(D) Retinopathy  
(E) Orthostatic hypotension

12. Which **ONE** of the following drugs is the first line treatment choice for hypertension in a patient with Type 2 diabetes?

(A) Bendroflumethiazide  
(B) Atenolol  
(C) Lisinopril  
(D) Doxazosin  
(E) Amlodipine

13. Which **ONE** of the following responses does thyroid hormone **NOT** cause in target cells/organs?

(A) Increased oxygen consumption  
(B) Increased body temperature  
(C) Increased cardiac output  
(D) Increased glycogen synthesis  
(E) Increased breakdown of energy stores
14. Which **ONE** of the following is **NOT** a sign or symptom of hypothyroidism?

(A) Bulging eyes  
(B) Fatigue  
(C) Dry, flaky skin  
(D) Constipation  
(E) Depression

15. Which **ONE** of the following is **NOT** used in the treatment of hyperthyroidism?

(A) Carbimazole  
(B) Propylthiouracil  
(C) Levothyroxine  
(D) Tri-iodothyronine  
(E) Radioactive iodine

16. With respect to the role of the pituitary gland which **ONE** of the following statements is **INCORRECT**?

(A) Peptide hormones produced by the hypothalamus are stored in the posterior pituitary  
(B) The two main hormones produced by the anterior pituitary are oxytocin and vasopressin (Antidiuretic hormone)  
(C) Gonadotrophin releasing hormone from the hypothalamus stimulates the release of follicle stimulating hormone (FSH) and luteinising hormone (LH) from the anterior pituitary  
(D) Cortisol produced by the adrenal cortex provides negative feedback to reduce the production of corticotrophin releasing hormone (CRH) from the hypothalamus  
(E) Prolactin is the only hormone produced by the anterior pituitary which does not undergo the “3 hormone sequence”

17. Which **ONE** of the following is **NOT** an effect of cortisol when released due to stress?

(A) Stimulation of protein catabolism  
(B) Stimulation of gluconeogenesis  
(C) Stimulation of triglyceride catabolism  
(D) Increase in vascular reactivity to norepinephrine  
(E) Stimulation of glucose uptake and oxidation by cells
18. With respect to the pharmacological use of steroids which ONE of the following statements is INCORRECT?

(A) Fludrocortisone is used to replace mineralocorticoids in Addison’s disease
(B) Patients on long term steroids are at risk of osteoporosis and should receive prophylactic therapy (e.g. bisphosphonates)
(C) High dose steroids can cause hyperglycaemia as a result of increased gluconeogenesis
(D) Patients who are prescribed steroids should avoid contact with people with chicken pox as their immune system will be suppressed and will not be able to fight the infection
(E) Patients who have received prednisolone 30 mg daily for 5 days should gradually reduce their dose and not discontinue therapy abruptly

19. Which ONE of the following is the major pharmaceutical application of a competitive aldosterone antagonist?

(A) Anti-inflammatory
(B) Oral contraceptive
(C) Potassium sparing diuretic
(D) Treatment of menstrual disorders
(E) Treatment for prostate cancer

20. Which ONE of the following is the CORRECT description of the activity of the molecule below?

(A) Oestrogenic
(B) Androgenic
(C) Glucocorticoid
(D) Progestogenic
(E) Mineralocorticoid

21. Which ONE of the following is the mode of action of tamoxifen?

(A) Oestrogen antagonist
(B) Androgen antagonist
(C) Corticosteroid
(D) Androgen agonist
(E) Oestrogen agonist
22. Which **ONE** of the following is an action or effect of progesterone in a female?

(A) Stimulates development of dominant follicle  
(B) Suppresses menstruation and uterine contraction during pregnancy  
(C) Stimulates proliferation of endometrium during follicular phase  
(D) Increases bone synthesis  
(E) Feed-back to pituitary gland to stimulate production of prolactin

23. Which **ONE** of the following describes the main mode of action of the progesterone only oral pill (POP)?

(A) Thinning of cervical mucus  
(B) Suppression of testosterone  
(C) Stimulation of prolactin  
(D) Delay ovum transport  
(E) Suppression of dopamine release

24. With respect to non-hormonal contraceptives, which **ONE** of the following statements is **CORRECT**?

(A) The male condom has an efficacy rate of 100% if used correctly  
(B) Female sterilisation is achieved by blocking the production of eggs within the ovaries  
(C) The intrauterine device (IUD) contains a copper device which is toxic to sperm and ova  
(D) Following pregnancy a woman can use the same size diaphragm or cap as she used before she became pregnant  
(E) Breast feeding will prevent pregnancy once a woman has recommenced menstruation

25. Which **ONE** of the following is **INCORRECT** with regards to erectile dysfunction?

(A) 25% of cases are drug induced  
(B) Caverject® injection is used for treatment  
(C) Sildenafil can be safely prescribed in combination with oral nitrates  
(D) 50% of men between 50-70 years have erectile dysfunction  
(E) Erectile dysfunction is a complication of diabetes
26. Which ONE of the following is INCORRECT regarding drugs and breastfeeding?

(A) A drug is more likely to enter breast milk in an unionised, lipid soluble form
(B) Not all drugs will cause harm to the baby if they enter the breast milk
(C) Drugs enter breast milk by passive diffusion down a concentration gradient
(D) The best time to breast feed a baby is just before the mother takes the next dose of her medication
(E) The combined oral contraceptive pill is safe to use in breastfeeding

27. Which ONE of the following is CORRECT regarding drugs in pregnancy?

(A) Isotretinoin is safe to use in pregnancy for the treatment of acne
(B) The foetus is most at risk of adverse effects of drugs between 3 and 8 weeks gestation
(C) Warfarin is a small molecule and therefore does not cross the placenta and so is safe to use in pregnancy
(D) 30% of all birth defects are caused by drug use in pregnancy
(E) Tetracycline taken by the mother during the 3rd trimester of pregnancy will cause discolouration of the mother’s teeth

28. Which ONE of the following T-scores would result in a diagnosis of osteopenia (low bone mass)?

(A) Above -1
(B) Between -1 and -2.5
(C) -2.5 or less
(D) -2.5 or less with a fracture
(E) +1

29. With respect to urinary incontinence which ONE of the following statements is INCORRECT?

(A) Drugs which can cause incontinence include diuretics
(B) Pelvic floor exercises used to treat incontinence strengthen the muscles under the uterus, bladder and bowel
(C) First line drug treatment for incontinence is with anticholinergic drugs
(D) Non pharmacological management of incontinence includes reducing fluid intake to 3-4 glasses per day
(E) Causes of stress incontinence include pregnancy, obesity and the menopause
30. Which **ONE** of the following is **NOT** a health risk or complication associated with a Body Mass Index of 35 kg / m$^2$?

(A) Type 2 Diabetes  
(B) Osteoporosis  
(C) Gall bladder disease  
(D) Osteoarthritis  
(E) Coronary heart disease

**END OF PART ONE**
PART TWO

Answer THREE of the FOUR questions. Use a SEPARATE answer book for EACH question in Part TWO.

31. Answer ALL parts (a) to (c).

(a) Describe the action of parathyroid hormone (PTH) on bone in relation to Ca^{2+} homeostasis. [50%]

(b) Osteoporosis causes increased bone fragility and fractures. Describe the factors which increase the risk of developing osteoporosis. [40%]

(c) Bisphosphonates (e.g. Alendronate) are used to treat and prevent osteoporosis. Describe their mechanism of action. [10%]

32. Answer BOTH parts.

(a) Describe the clinical manifestations of early or undiagnosed Diabetes Mellitus (DM). Your answer should include the differences between Type 1 DM and Type 2 DM and those which are common to both. [60%]

(b) Insulin is used to manage both Type 1 and Type 2 DM. Describe the potential clinical problems that are associated with the use of insulin. [40%]

33. Answer BOTH parts.

(a) The hypothalamus and the pituitary are involved in the control and production of luteinising hormone (LH) and follicle stimulating hormone (FSH). Describe the role of these hormones in male sexual function. [40%]

(b) Describe the advantages and disadvantages of the following forms of non-hormonal contraception:

(i) Intrauterine device (IUD)
(ii) Diaphragm/cap
(iii) Male condom [60%]
34. Answer ALL parts (a) to (c).

(a) Briefly describe the mechanisms by which insulin lowers blood glucose. [20%]

(b) Give details of how increased uptake of glucose into cells is mediated by insulin. [30%]

(c) Diabetic foot is a recognised long term complication of Diabetes Mellitus (DM):

(i) Describe the underlying causes of diabetic foot.

(ii) Describe the role of the pharmacist in the prevention of diabetic foot. [50%]

END OF PAPER