REPUBLIC OF KENYA

MINISTRY OF HEALTH

PHARMACY AND POISONS BOARD

MODEL EXAMINATION QUESTION PAPER

STAGE ONE: PAPER 1

TIME: 9.00 A.M. – 12.00 NOON **DATE:** SEPTEMBER 2017

EXAM NUMBER: ……..

INSTRUCTIONS TO CANDIDATES

This examination consists of **THREE PARTS** as follows:

Part I:

This consists of **100 Multiple Choice Questions**. **Use the answer sheet** provided to indicate to indicate your answer choices. For each question, select **only one** most appropriate answer choice. Write your Exam Number clearly on the separate answer sheet provided using blue or black ink pen.

Part II:

This part consists of **15 Short Answer Questions**. Answer **all** the questions in the spaces provided.

Part III:

This consists of **3 Essay Questions**. Attempt **all**. Write **all** your answers on the sheets of paper provided. **Start each question on a separate sheet of paper and write your Exam Number on all the answer sheets.**

At the end of the examination, put all your answers sheets in the envelope provided. Write **your Exam Number** on the envelope. **DO NOT** write your name on the Answers Sheet, any page of this Examination Paper nor the envelope.

PART I

This part consists of Multiple Choice Questions. Use the answer sheet provided to indicate your answer choices

1. Which of the following is true about toxocariasis?
    A. The infestation is acquired from either dogs or cats
    B. Infestation occurs through ingestion of larvae
    C. Intraocular calcification is a common feature
    D. Steroids are contraindicated

2. Onchocerciasis is
    A. caused by protozoa
    B. transmitted by the bite of a fly
    C. confined to the Asian continent
    D. associated with dysentery

3. Which of the following is true of gas gangrene?
    A. It is caused by *Clostridium perfringens*
    B. It is caused by a Gram-negative bacillus
    C. The disease is characterized by spastic paralysis
    D. High dose erythromycin is the treatment of choice

4. A 6 month old infant presents to the clinic with diarrhoea. The most likely causative organism is
    A. Entamoeba histolytica
    B. rotavirus
    C. Giardia lamblia
    D. Shigella dysenteriae

5. Enteropathogenic, enterohemorrhagic and enteroinvasive microorganisms refer to
    A. *Shigella dysenteriae*
    B. *Proteus arbutus*
    C. *Vibrio cholera*
    D. *Escherichia coli*

6. Painless haematuria is seen in
    A. *Schistosoma hematobium*
    B. *Schistosoma mansoni*
    C. *Schistosoma japonicum*
    D. *Paragonimus westermani*

7. Babesiosis is transmitted by
    A. tick
    B. mite
    C. flea
    D. mosquito

8. *Neisseria gonorrhoeae*
    A. causes syphilis
    B. can infect the eye
    C. is a common cause of meningitis
    D. is a normal commensal in vagina

9. Which of the following tapeworm is the shortest?
    A. Taenia saginata
    B. Taenia solium
    C. *Hymenolopsis nana*
    D. Diphyllobothrium latum

10. Calabar swelling is seen in infections with
    A. Onchocerca volvulus
    B. *Loa loa*
    C. Burgia timori
    D. Wuchereria bancrofti

11. Which of the following organism ingest red blood cells?
    A. *Entamoeba coli*
    B. *Iodamoeba butschlii*
    C. *Entamoeba histolytica*
    D. *Dientamoeba flagilis*

12. Vaginal discharge due to with *Trichomonas vaginalis* is
    A. thin and watery
    B. greenish frothy
    C. curd-white
    D. blood stained

13. Which type of antibody is most effective in activating complement?
    A. Ig G
    B. Ig E
    C. IgA
    D. IgM

14. Antibodies are produced by
    A. mast cells
    B. plasma cells
    C. dendritic cells
    D. Kuppfer cells

15. Which statement best describes the intermolecular bonding in HCN?
    A. Electrostatic attractions between H^+ and CN^- ions
    B. Only van der Waals' force
    C. Van der Waals' force and hydrogen bonding
    D. Electrostatic attraction between pairs of electrons and positively charged nuclei

16. What is the standard entropy change, ΔS^θ, for the following reaction?

$$2CO(g) + O_2(g) \rightarrow 2CO_2(g)$$

	CO(g)	$O_2(g)$	$CO_2(g)$
$S^\theta/kJ^{-1}\ mol^{-1}$	198	205	214

    A. -189
    B. -173
    C. +173
    D. +189

17. What is the correct sequence for processes occurring in a mass spectrometer?
    A. Vaporization, ionization, acceleration, deflection
    B. Vaporization, acceleration, ionization, deflection
    C. Ionization, vaporization, acceleration, deflection
    D. Ionization, vaporization, deflection, acceleration

18. Which of the following reaction has the most negative ΔH^θ value
    A. $LiF_{(s)} \longrightarrow Li_{(g)} + F^-_{(g)}$
    B. $Li^+_{(g)} + F^-_{(g)} \longrightarrow LiF_{(s)}$
    C. $NaCl_{(s)} \longrightarrow Na^+_{(g)} + Cl^-_{(g)}$
    D. $Na^+_{(g)} + Cl^-_{(g)} \longrightarrow NaCl_{(s)}$

19. Which statement about indicators is always correct?
    A. The mid-point of the pH range of an indicator is 7
    B. The pH range is greater for indicators with higher pK_a values
    C. The colour red indicates an acidic solution
    D. The pK_a value of the indicator is within its pH range

20. Which of the following methods will distinguish between equimolar solutions of a strong base and strong acid?

I. Add magnesium to each solution and look for the formation of gas bubbles
II. Add aqueous sodium hydroxide to each solution and measure the temperature change
III. Connect each solution to a circuit with a battery and lamp, and see how bright the lamp glows

A. I and II only
B. I and III only
C. II and III only
D. I, II and III

21. As the size of the halogen molecules, X_2, increases down the periodic table group, their boiling points
A. decrease due to decreasing electronegativity
B. decrease due to decreasing bond energies
C. increases due to increasing permanent dipole – dipole attraction
D. increasing due to increasing van der Waal' forces

22. Boron is used in the following except
A. glass containers
B. antidepressants
C. cleaning agents
D. eye washes

23. Which of the following chemical formula corresponds to perchloric acid?
A. $CHCl_3$
B. HCl
C. $HClO_4$·
D. $HClO_3$

24. The chemical formula and name of epsom salt is
A. $MgSO_4.7H_2O$; Magnesium sulfate heptahydrate
B. CaO; calcium oxide
C. Al_2O_3; aluminium trioxide
D. $Na_2CO_3.10H_2O$; sodium carbonate decahydrate

25. Trans and cis isomers are
A. enantiomers
B. optical isomers
C. geometric isomers
D. conformational isomers

26. Chiral molecules
    A. have same arrangement but different orientation of groups in space
    B. contain an asymmetric carbon bonded to different groups
    C. are mirror images of each other but cannot be superimposed
    D. can rotate the plane of polarized light clockwise

27. Cycloalkanes have the general formula
    A. C_nH_{2n+2}
    B. C_nH_{2n}
    C. C_nH_n
    D. C_nH_{n-2}

28. Hydration of alkenes results in
    A. alkanes
    B. polyalkenes
    C. alcohols
    D. alkene hydrides

29. The benzene ring structure was proposed by
    A. Markovnikov
    B. Faraday
    C. Newton
    D. Kekule

30. All the following are carbonyl compounds except
    A. amides
    B. anhydrides
    C. acetals
    D. esters

31. In nucleophilic substitution, the
    A. electrophile must be sp^2 hybridized
    B. electrophile must have a leaving group
    C. nucleophile reacts with the electron donor
    D. nucleophile competes with the electrophile

32. Reaction of a primary alcohol with potassium permanganate results in a(n)
    A. aldehyde
    B. alkane
    C. anhydride
    D. salt

33. An aldol condensation to form β-hydroxybutyraldehyde involves the reaction of
    A. two acetaldehyde molecules
    B. acetaldehyde and methanol
    C. acetaldehyde and acetone
    D. acetaldehyde and ethanol

34. In carbon NMR, which of the following carbons is expected to be most downfield?
    A. Alkane
    B. Carbonyl
    C. Aromatic
    D. Chiral

35. The number of carbons in propionic anhydride is
    A. 6
    B. 5
    C. 4
    D. 3

36. Atrial natriuretic peptides
    A. increase water reabsorption
    B. decrease sodium reabsorption
    C. increase sodium reabsorption
    D. decrease in injection velocity

37. Which of the following will not increase aortic systolic blood pressure?
    A. Decrease in arterial compliance
    B. Decrease in aortic distensibility
    C. Increase in stroke volume
    D. Decrease in injection velocity

38. Which of the following is incorrect concerning a patient with ventricular tachycardia?
    A. It occurs when the heart rate drops to low levels
    B. Cardiac output can fall to very low levels
    C. Arterial blood pressure falls to low levels
    D. It involves impaired ventricular filling

39. If the rate of salivary secretion is increased, which of the following changes in ionic concentrations occurs?
    A. Sodium increases
    B. Bicarbonate decreases
    C. Chloride decreases
    D. Potassium increases

40. Which of the following does not regulate gastric acid secretion?
    A. Histamine
    B. Cholecystokinin
    C. Gastrin
    D. Acetylcholine

41. The following effects are mediated by H2-receptors except
    A. vasodilation
    B. bronchoconstriction
    C. gastric acid secretion
    D. tachycardia

42. Acidosis can be caused by
    A. vomiting
    B. diarrhoea
    C. hyperventilation
    D. polydipsia

43. Damage of the eighth cranial nerve can cause
    A. loss of body balance
    B. blindness
    C. profuse diarrhoea
    D. loss of sense of smell

44. Digestion of proteins begins in the
    A. mouth
    B. stomach
    C. duodenum
    D. jejunum

45. Myocardial ischaemia in shock is mainly due to
    A. decreased coronary artery pressure
    B. increased myocardial oxygen demand
    C. decreased myocardial oxygen supply
    D. hyperplasia of myocardial cells

46. During rigorous exercise, oxygen consumption is greatest in the
    A. brain
    B. heart
    C. skeletal muscles
    D. liver

47. Which of the following ions is not regulated by a hormone in the kidney?
    A. Sodium
    B. Potassium
    C. Calcium
    D. Copper

48. Gastric emptying is slowest after consuming a meal high in
    A. protein
    B. fat
    C. fiber
    D. carbohydrate

49. The cell organelle responsible for DNA replication is
    A. smooth endoplasmic reticulum
    B. rough endoplasmic reticulum
    C. mitochondrion
    D. lysosome

50. The reason for a thicker left than right ventricular wall in the heart is that it
    A. performs less work
    B. is made of bigger cells
    C. is made of smaller cells
    D. performs more work

51. The normal heart pacemaker is
    A. atrio-ventricular node
    B. Purkinje tissues
    C. Sino-atrial node
    D. bundle of His

52. Blood pressure builds up in the glomerulus because
    A. efferent artery is wider than afferent artery
    B. efferent artery is narrower than afferent artery
    C. the glomerulus has high albumin concentration
    D. the glomerulus has high glucose concentration

53. Which of the following cells are found in tissues?
    A. Erythrocytes
    B. Melanocytes
    C. Macrophages
    D. Osteocytes

54. Osteoblasts refers to
    A. dead bone cells
    B. newly formed bone cells
    C. cells involved in bone resorption
    D. cells in bone marrow

55. The islet cells of Langerhans
    A. are located in the liver
    B. are made up of only three different cell types
    C. secrete glucagon and somatostatin
    D. are mainly made up of a cells

56. The adrenal cortex does not secrete
    A. glucocorticoids
    B. epinephrine
    C. sex hormones
    D. aldosterone

57. Tropic hormones
    A. stimulate secretion of other hormones
    B. exclude luteinizing hormones
    C. are excreted by the thyroid gland
    D. include oxytocin and vasopressin

58. The alveoli
    A. warm up air
    B. secret surfactant
    C. have cartrilage
    D. form the dead space in lungs

59. Carbon dioxide in blood is mainly transported in the form of
    A. carbonic acid
    B. carboxy-haemoglobin
    C. gaseous carbon dioxide
    D. calcium bicarbonate

60. Respiration is regulated
    A. only in the medulla oblongata
    B. by both voluntary and autonomic control
    C. in the lumbar part of the spinal column
    D. in the hypothalamus

61. The unit “decibels” is used to measure

    A. loudness of a sound
    B. pitch of a sound
    C. conduction efficiency of the outer ear
    D. velocity of sound conduction

62. Histology is the study of
    A. structural features of a body
    B. surface features of a body
    C. cells
    D. tissue

63. In anatomy the term “inferior” refers to
    A. nearer to the feet
    B. nearer to the back
    C. further from the median plane
    D. the prone position

64. The number of regions that the abdomen has been divided into for the purpose of describing the location of internal organs is
    A. 4
    B. 8
    C. 9
    D. 2

65. Which of the following cells is not found in connective tissues?
    A. Fibroblasts
    B. Macrophages
    C. Mast cells
    D. Columnar epithelium

66. Cartilage
    A. is as rigid as home
    B. cannot undergo ossification
    C. is a specialized connective tissue
    D. covers all bones

67. The two ends of a long bone are called
    A. epiphysis and diaphysis
    B. endosteum and hyaline
    C. lamellus and osteocyte
    D. osteon and periosteum

68. The basic structural and functional cell of the nervous system is the
    A. neuron
    B. dendrite
    C. Schwann cell
    D. glial cell

69. Which of the following is not a cranial nerve?
    A. olfactory
    B. vagus
    C. accessory
    D. iliac

70. The membrane that covers the lungs is the
    A. pleura
    B. paracentesis
    C. diaphragm
    D. intercostal

71. The nerve that supplies the forearm muscles are
    A. sciatic and phrenic
    B. ulnar and radial
    C. obturator and pelvic
    D. vagal and phrenic

72. Calculate the concentration ratio of acetate and acid required to buffer a system at pH 5.0 (pK_a of the acetate/acetic acid pair = 4.76).
    A. 1.74
    B. 2.74
    C. 3.0
    D. 3.54

73. Which of the following amino acids have aromatic side moieties?
    A. Glycine, alanine, tyrosine
    B. Valine, leucine, glutamate
    C. Phenylalanine, tyrosine, tryptophan
    D. Serine , threonine, cysteine

74. The type of enzyme inhibition demonstrated when methanol poisoning is treated with ethanol is
    A. irreversible
    B. reversible uncompetitive
    C. reversible competitive
    D. reversible mixed

75. Why do animal cells store fuel in form of glycogen as opposed to glucose?
    A. Glycogen is insoluble and thus does not affect osmolarity of cell
    B. Glycogen is extensively branched and more compact than glucose
    C. Glycogen has a higher molecular weight
    D. Glycogen is composed of both amylase and amylopectin

76. Which of the following enzymes is not involved in the urea cycle?
    A. Glucose-6-phosphate dehydrogenase
    B. Carbamoyl phosphate synthase I
    C. Ornithine transcarbamoylase
    D. Argininosuccinase

77. Dietary intake of valine, isoleucine and isoleucine is restricted in
    A. diabetes mellitus
    B. phenylketonuria
    C. alkaptonuria
    D. maple syrup urine disease

78. Which of the following lipoproteins is correctly matched with its function?
    A. Chylomicrons: carry cholesterol to the liver
    B. VLDL: move dietary triacylgylcerols from intestine to other tissues
    C. LDL: trigger clearance of chylomicrons
    D. HDL: catalyze formation of cholesterol esters from lecithin and cholesterol

79. How many ATP molecules are produced from each turn of the citric acid cycle?
    A. 3
    B. 6
    C. 12
    D. 18

80. Which of these ketone bodies can be used as a fuel by the heart muscle and renal cortex?
    A. Acetoacetate, D-3-hydroxybutyrate
    B. Acetone, acetoacetate
    C. Fumarate, D-3-hydroxybutyrate
    D. Carnitine, biotin

81. Which of these hemoglobins has the highest oxygen affinity under physiological condition?
    A. Hemoglobin A
    B. Hemoglobin F
    C. Hemoglobin S
    D. Hemoglobin A_{1c} (HbA_{1C})

82. Non-specific uptake of extracellular fluid via small vesicles that pinch off from the plasma membrane is termed as…..
    A. exocytosis
    B. phagocytosis
    C. cell signaling
    D. pinocytosis

83. Which of the following are products of the pentose phosphate pathway?
    A. D-Ribose - 5- phosphate, NADPH
    B. D-Ribose - 5- phosphate, $NADP^+$
    C. D-Ribulose - 5- phosphate, NADPH
    D. D-Ribulose - 5- phosphate, $NADP^+$

84. Which of these is not an effect of Insulin?
    A. Increased glucose uptake by muscle
    B. Increased glycogen synthesis by liver
    C. Increase fatty acid synthesis by liver
    D. Decrease triacylglycerol synthesis of adipose tissue

85. The base in the DNA structure that is replaced by uracil in the RNA structure is
    A. adenine
    B. guanine
    C. thymine
    D. cytosine

86. The strongest hydrogen bonds between two DNA strands involves
    A. guanine - cytosine pairs
    B. guanine – thymine pairs
    C. cytosine – uracil pairs
    D. cytosine – thymine pairs

87. The genetic information stored in the DNA is transformed into protein via the process of
    A. transcription
    B. translation
    C. replication
    D. super coiling

88. During DNA replication
    A. polymerization proceeds from the 3′ to 5′ direction
    B. the newly formed strands proceed in the same direction
    C. the formation of both strands take place simultaneously
    D. the speed of polymerization is similar in both strands

89. Denaturation of protein may result from all the following except
    A. application of heat
    B. addition of organic solutions
    C. mixing with solution of other protein
    D. raising the pH of the solution

90. The term ‘zwitterion” refers to an amino acid that
    A. is positively charged
    B. is not ionized
    C. carries a negative charge
    D. carries both positive and negative charges

91. The tertiary structure of a protein describes
    A. the sequence of amino acids in a polypeptide chain
    B. the arrangement and interaction of various regions and domains of a single polypeptide chain
    C. the arrangement of proteins with two or more chains held together by hydrogen bond
    D. interaction of amino acids close in a single polypeptide

92. Allosteric effectors of enzymatic activity are

    A. substrates of the enzymes they regulate
    B. end products of a series of reactions catalyzed by the regulated enzyme
    C. small molecule that little structural similarity to substrates of regulated enzymes
    D. structural analogues of substrates of regulated enzymes

93. True oxidases are enzymes that catalyze the removal of hydrogen from substrates and
    A. all contain copper
    B. can use oxygen or artificial substances as hydrogen acceptors
    C. use nitrate as the hydrogen acceptor
    D. use coenzymes as the hydrogen acceptor

94. An oligosaccharide upon hydrolysis yields
    A. two similar molecules
    B. 3 to 6 units of monomeric sugar molecules
    C. more than 6 but less than 10 units of monomeric sugar molecules
    D. three units of monomeric units that must be different

95. The breakdown of glycogen to release glucose is referred to as
    A. glycolysis
    B. gluconeogenesis
    C. glycogenolysis
    D. glycogenesis

96. Cytochromes are enzymes that
    A. are universally soluble
    B. catalyze the transfer of hydrogen from substrates to oxygen
    C. utilize hydrogen peroxide as a substrate
    D. require iron ions to function

97. The following B complex vitamins have a role in the citric acid cycle except
    A. thiamine
    B. pantothenic acid
    C. cyanocobalamin
    D. riboflavin

98. In the pentose phosphate pathway of metabolism
    A. high levels of ATP are generated
    B. NADPH is generated
    C. Only 2 molecules of carbon dioxide are produced
    D. Glucose cannot be completely oxidized

99. The galactose tolerance test is based on the ability of liver to convert
    A. lactose to galactose
    B. galactose to glucose
    C. galactose to lactose
    D. glucose to lactose

100. The metabolism of fatty acids with odd number of carbon atoms differ from that of those with even number of carbons in that
    A. propionyl CoA and acetyl CoA are produced
    B. two molecules of acetyl CoA are produced
    C. it does not involve catalysis by acyl CoA synthase
    D. metabolism takes place without involvement of carnitine

PART II:

This section consists of Short Answer Questions. Answer ALL questions in the spaces provided

1. Outline any **five** functions of the skin (5 marks)

2. a) State any **three** diseases caused by *Haemophilus influenzae* (3 marks)

   b) List any **four** diseases associated with Helicobacter pylori (2 marks)

3. Outline the mode of transmission of each of the following pathogens. (5 marks)
   a) Polio virus

   b) Onchocera volvulus

   c) Strongyloides stercolaris

   d) *Taenia solium*

   e) Measles virus

4. Using an illustration describe the conduction of an action potential in the heart (5 marks)

5. State any **five** functions of the following brain components (5 marks)
   a) Cerebral cortex

   b) Brain stem

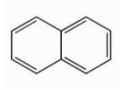
6. a) Outline any **three** endocrine roles of the kidney (3 marks)

   b) Mention any **four** enzymes secreted by the pancreas (2marks)

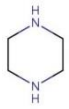
7. Name the following heterocyclic ring structures (5 marks)
   a)

   b)

c)



d)



e)

8. Indicate the type of titrimetric technique (neutralization, precipitation, complexometric, redox or acid-base) where the following indicators are used (5 marks)

   a) Starch iodide paste .....
   b) Eosin .....
   c) Murexide .....
   d) Methyl red .....
   e) Potassium chromate .....

9. List any **five** properties that make water support life on earth (5 marks)

10. Compare competitive and non- competitive enzyme inhibition (5 marks)

11. Give any **five** intermediates that are generated during the oxidative phase of the pentose monophosphate shunt 5 marks)

12. For each of the following drugs, name the active metabolite. (5 marks)
    a) Terfenadine .....
    b) Ebastine .....
    c) Thioridazine .....
    d) Primidone .....
    e) Clorazepate potassium .....

13. State **one** clinical use of each of the following antihistaminic drugs (5 marks)
    a) Betahistine
    b) Cyproheptadine
    c) Ketotifen
    d) Pirenzepine
    e) Cinnarizine

14. Indicate whether the following statements state are true or false (5 marks)
    a) Zileoton is a lipooxygenase inhibitor used as an anti-asthmatic
    b) Buspirone is a selective serotonin re-uptake inhibitor
    c) Tinidazole is a short acting 5-nitroimidazole
    d) Paromomycin is an antibiotic with anti-protozoal properties
    e) Midazolam is a more potent anticonvulsant agent than diazepam

15. a) Give **two** reasons why impurities must be controlled in drug substances (2 marks)

    b) Give any two sources of inorganic impurities. (2 marks)

    c) Name the most likely organic impurity in Aspirin (1 mark)

PART III:

This part consists of 3 Essay Questions. Attempt ALL.

1. a)
   i) Outline the role of muscles used in inspiration (5 marks)

   ii) Describe the structural organization of myofibril in skeletal muscle (5 marks)

   iii) Explain why
   a) smooth muscle is not striated? (2 marks)

   b) GIT muscularies externa display pacemaker potential? (3 marks)

   b) Outline any **five** extra intestinal manifestations of amoebiasis (5 marks)

   c) Describe any **five** functions of bones in the body (5 marks)

2. a)
   i) What is meant by the term "colligative properties' of a solution? (1mark)

   ii) Which are the colligative properties of solutions? (4 marks)

   iii) Give the strategies used for increasing solubility of poorly soluble substances (5 marks)

   b) List any five substrates of the tri-carboxylic acid cycle stating the product of each substrate in the cycle (5 marks)

   c) Describe the following processes associated with biological membranes (5 marks)
      i) Phagocytosis

      ii) Fluid Phase pinocytosis

      iii) Absorptive pinocytosis

      iv) Exocytosis

      v) Active transport

   d) Give **one** function of the following hormones in human body

      i) Luteinizing hormone

      ii) Prolactin

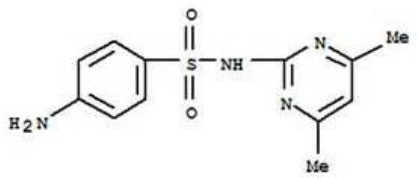
iii) Follicle stimulating hormone

iv) Oxytocin

v) Vasopressin

vi) Aldosterone

3. a) Sulphadimidine can be assayed by diazotization through titration with 0.1N $NaNO_2$



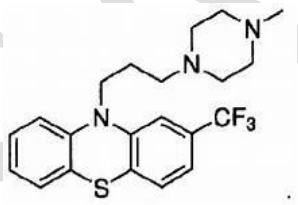
... Sulphadimidine

i) State one major experimental condition that would ensure that the diazotization reaction is quantitative (1mark)

ii) Describe two methods used in determining the endpoint of the diazotization titrations (4 marks)

iii) Derive the equivalence of titrating 0.1N $NaNO_2$ solution with sulfadimidine given that the molecular weight of sulfadimidine is 278.3 (4 marks)

b)



. Compound A

i) Identify compound A (1mark)

ii) What general name is given to compounds with the 3-fused-ring system like in compound A? (1 mark)

iii) What receptor do compounds with structure in (ii) above bind to? (1mark)

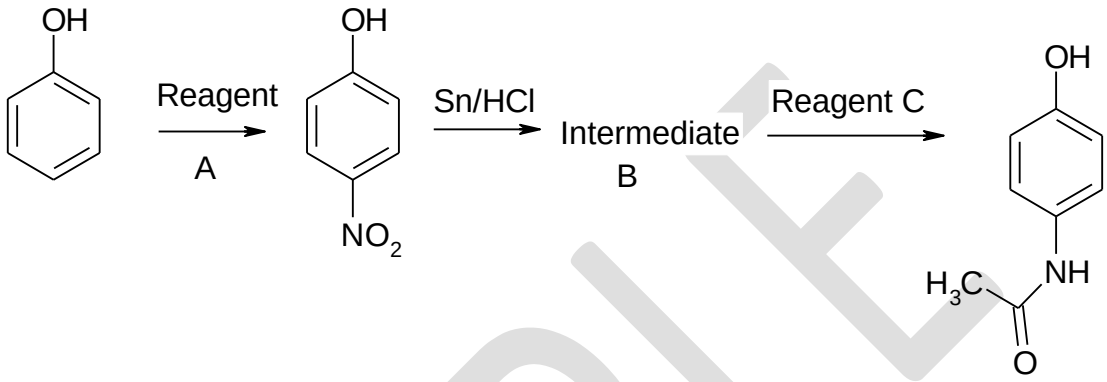
iv) What feature in the compound enables the compound to be formulated as an orally bioavailable formulation? (2marks)

v) What effect would the shortening of the chain between ring nucleus and the terminal nitrogen have? (2marks)

vi) Name one compound with a 2 –carbon chain between ring nucleus and the terminal nitrogen (2marks)

vii) Give with justification, one method of assay of compound A (2marks)

c) Paracetamol can be synthesized from phenol according to the scheme below



i) Name reagent A (1mark)

ii) Draw structure of intermediate B (2 mark)

iii) What is the reagent C? (1 mark)

iv) State one analytical method by which the amount of reagent B is controlled for in paracetamol. (1 mark)