MULTIPLE-CHOICE QUESTIONS

SECTION I

For each of the following numbered items in the left-hand column, choose the most correct lettered item from the right-hand column that best applies:

1.	Juxtaglomerular cells.	(*a*) Afferent vessels in the corticomedullary joining directly the peritubular capillaries without forming glomerular tuft.
2.	Renal columns of Bertin.	(*b*) Branched satellate cells between the endothelium and basal lamina of the glomerulus having proliferative and phagocytic properties.
3.	Mesangial cells.	(*c*) Modified epithelial cells of the distal convoluted tubules lying in contact with the afferent glomerular vessels of the same nephron.
4.	Macula densa.	(*d*) Agranular cell mass lying within the vascular pole formed by the afferent and efferent glomerular vessels.
5.	'Lacis' cells.	(*e*) Projections of renal cortex in between the two pyramids forming its lateral boundaries.
6.	Ludwig shunt.	(*f*) Marked reduction of urine volume.
7.	Trueta shunt.	(*g*) Thick cuff of modified muscle cells in the media of afferent arteriole just before it enters the glomerulus.
8.	Anuria.	(*h*) Efferent vessels of juxtamedullary glomeruli draining directly into the venous plexus without joining the peritubular network.
9.	Oliguria.	(*i*) Complete suppression of urine volume.

10. **In resting state flowing blood through a kidney per minute is approximately:**
    (*a*) 200–300 ml per min.
    (*b*) 400–500 ml per min.
    (*c*) 1200–1300 ml per min.
    (*d*) 5000–6000 ml per min.
    (*e*) None of these.

11. **Glomerular filtration pressure is:**
    (*a*) 15 mm of Hg.
    (*b*) 25 mm of Hg.
    (*c*) 35 mm of Hg.
    (*d*) 65 mm of Hg.
    (*e*) 100 mm of Hg.

12. **The normal glomerular filtration rate is approximately:**
    (*a*) 20 ml per min.
    (*b*) 50 ml per min.
    (*c*) 120–125 ml per min.
    (*d*) 300 ml per min.
    (*e*) None of these.

13. **Over 99% of the glomerular filtrate are reabsorbed and are approximately:**
(*a*) 184 litres. (*c*) 25 litres.
(*b*) 90 litres. (*d*) 2 litres.
(*e*) None of these.

14. **Tuft of capillary vessels which is surrounded by the Bowman's capsule is known as:**
(*a*) Glomerulus.
(*b*) Malpighian corpuscle.
(*c*) Loop of Henle.
(*d*) Juxtaglomerular apparatus.
(*e*) None of these.

15. **Area cribrosa is the apex of the renal papilla. It opens directly into the:**
(*a*) Major calyx.
(*b*) Minor calyx.
(*c*) Bowman's capsule.
(*d*) Ureter.
(*e*) Urinary bladder.

16. **Human renal tubule is:**
(*a*) 100 mm in length.
(*b*) 60 mm in length.
(*c*) 30 mm in length.
(*d*) 15 mm in length.
(*e*) None of these.

17. **Blood flow per gram of kidney tissue per minute is:**
(*a*) 0·05–1 ml.
(*b*) 3–4 ml.
(*c*) 10–12 ml.
(*d*) 20–25 ml.
(*e*) None of these.

18. **Intrarenal sodium-feedback theory is related with:**
(*a*) Autoregulation of renal blood flow.
(*b*) Regulation of acid-base balance by the kidney.
(*c*) Mechanism of micturition.
(*d*) All of these.
(*e*) None of these.

19. **Release of renin probably depends on:**
(*a*) Glomerular filtration rate (GFR).
(*b*) Sympathetic nerve activity.
(*c*) Parasympathetic nerve activity.
(*d*) Both (*a*) and (*b*).
(*e*) Both (*a*) and (*c*)

20. **Glucose reabsorption takes place in the:**
(*a*) Bowman's capsule.
(*b*) First-half of the proximal tubule.
(*c*) Distal tubule.
(*d*) Loop of Henle.
(*e*) None of these.

21. **The interior of urinary bladder is lined by:**
(*a*) Columnar epithelium.
(*b*) Squamous epithelium.
(*c*) Transitional epithelium.
(*d*) Goblet cells.
(*e*) None of these.

22. **Normal desire for micturition is felt when the amount of urine collected in the bladder is:**
(*a*) 25–50 ml.
(*b*) 50–100 ml.
(*c*) 100–200 ml.
(*d*) 300–400 ml.
(*e*) 1000–1500 ml.

23. **The antidiuretic hormone (ADH) is secreted by:**
(*a*) Renal cortex.
(*b*) Renal medulla.
(*c*) Anterior pituitary.
(*d*) Posterior pituitary.
(*e*) None of these.

24. **Administration of the antidiuretic hormone (ADH):**
(*a*) Decreases water loss by the lungs.
(*b*) Increases perspiration.
(*c*) Decreases the rate of the active reabsorption of water by the kidney.
(*d*) Increases active reabsorption of water by the distal tubule of the kidney.
(*e*) None of these.

25. **A substance generally used to measure the glomerular filtration rate is:**
(*a*) Insulin.
(*b*) Inulin.
(*c*) Diodrast.
(*d*) Para-amino hippuric (PAH) acid.
(*e*) None of these.

26. **A substance generally used for measuring renal plasma flow:**
(*a*) Ethyl alcohol.
(*b*) Inulin.
(*c*) Para-amino hippuric acid.
(*d*) Glucose.
(*e*) Diodrast.

From the following directions given below, select answers for questions 27–30:
(*a*) If *i* is greater than *ii*.
(*b*) If *ii* is greater than *i*.
(*c*) If *i* and *ii* are equal, or very nearly equal.

27. (*i*) Blood flow rate in the cortex of the kidney.
(*ii*) Blood flow rate in the medulla of the kidney.

28. (*i*) Size of the right kidney.
(*ii*) Size of the left kidney.

29. (*i*) Total number of superficial nephrons.
(*ii*) Total number of juxtamedullary nephrons.
30. (*i*) Length of afferent vessels of glomerulus.
(*ii*) Length of efferent vessels of glomerulus.

From the following directions given below, select answers for questions 31–37:

(*a*) If statements *i*, *ii* and *iii* are all correct.
(*b*) If statements *i* and *iii* are correct.
(*c*) If statements *ii* and *iv* are correct.
(*d*) If the statement *iv* only is correct.

31. (*i*) Renal artery divides into anterior and posterior divisions.
(*ii*) Branches of the anterior division anastomose with one other.
(*iii*) Branches from the posterior division also anastomose with one other.
(*iv*) Arcuate arteries which are branches from the interlobar arteries freely communicate with one other.

32. (*i*) In the kidney, the blood usually passes through double capillary networks—the glomerular tuft and the peritubular tuft.
(*ii*) The function of glomerular tuft is to reabsorb and the peritubular tuft is to filter.
(*iii*) Glomerular blood pressure is 3–4 times more than the capillary pressure elsewhere.
(*iv*) Under basal condition, renal blood flow is altered in denervated kidney.

33. (*i*) Administration of high dose of epinephrine increases blood pressure but profoundly decreases the renal blood flow.
(*ii*) Exercise in recumbent position profoundly decreases renal blood flow.
(*iii*) Exercise in upright position produces renal vasoconstriction and decreases in renal blood flow.
(*iv*) Hypercapnia and acidosis increase renal blood flow.

34. (*i*) Absorption of glucose by the renal tube is an active process.
(*ii*) The reabsorption rate of glucose depends on the availability of the carrier substance present in the tubular epithelium.
(*iii*) Phloridzin binds strongly to the carrier substance and prevents combination of glucose with the carrier substance.
(*iv*) Insulin inhibits glucose reabsorption.

35. (*i*) In the proximal tubule water and chloride reabsorptions are active process.
(*ii*) Water reabsorption from the proximal tubule is known as facultative water reabsorption.
(*iii*) Distal tubular water reabsorption is a passive process and is known as obligatory water reabsorption.
(*iv*) There is a maximum limit beyond which the urine cannot be concentrated.

36. **A nephron is the functional unit of the kidney:**
(*i*) There are about 1000 nephrons in each human kidney.
(*ii*) In man it consists of Bowman's capsule and renal tubules.
(*iii*) These two parts of the nephron have same function.
(*iv*) In certain fishes the nephron possesses only the tubule.

37. **In clearance tests both blood and urine are analysed:**
(*i*) Urea clearance test is quantity of urea that is cleared from plasma.
(*ii*) Urea clearance test is the volume of plasma completely cleared of urea. (*iii*) In renal diseases urea clearance value is increased.
(*iv*) In normal human adults maximum urea clearance averages 70 + 15 ml/minute.

From the following directions, select answers for questions 38-45:
(*a*) If the statement is correct and the reason is also correct.
(*b*) If the statement is correct but the reason is wrong.
(*c*) If the statement is wrong but the reason is correct.
(*d*) If the statement is wrong and the reason is also wrong.

38. The glomerular blood pressure is much higher than the capillary bed elsewhere, *because* the afferent vessels are long and narrow whereas the efferent vessels are short and wide.
39. Major part of the renal circulation normally passes through the juxtamedullary glomeruli, *because* the afferent vessels of juxtamedullary glomeruli arise at an angle most suitable for free flow of blood stream.
40. Ischaemic kidney produces hypertension, *because* such kidney liberates a substance—renin.
41. Glucose is not reabsorbed through phosphorylation, *because* dinitrophenol which uncouples oxidation and phosphorylation, does not block reabsorption of glucose.
42. After high protein diet urine volume is reduced, *because* urea, sulphate and phosphate resulting from protein metabolism retain water in the tubules to keep those materials in solution.
43. In fever, diabetes or in excessive adrenocortical activity urea excretion in the urine is increased, *because* in the above conditions there is increased protein catabolism.
44. In nephritis, excretion of urea is increased, *because* ability of the kidney to excrete urea is severely impaired in nephritis.
45. Hypogastric nerves (sympathetic) are called the nerves of emptying, *because* sympathetic stimulation causes strong contraction of the bladder and relaxation of internal sphincter.

Select respective answer, in each case, for the above question from the following references of the text:

Q. No.	Ref. Page(s)	Q. No.	Ref Page(s)	Q. No.	Ref. Page(s)
1.	1-4, 4-13	2.	1-2	3.	1-6, 1-7
4.	1-14	5.	1-14	6.	1-15
7.	1-16	8.	1-60	9.	1-60
10.	1-17	11.	1-25, 1-26	12.	1-27, 1-42
13.	1-29	14.	1-4	15.	1-2
16.	1-8	17.	1-18	18.	1-20
19.	1-22, 1-23	20.	1-28-1-29	21.	1-61
22.	1-62	23.	1-32	24.	1-32, 4-50
25.	1-41	26.	1-24	27.	**a**, 1-18
28.	**b**, 1-1	29.	**a**, 1-2, 1-3	30.	**b**, 1-4
31.	**b**, 1-15	32.	**b**, 1-16, 1-17	33.	**b**, 1-21
34.	**a**, 1-28, 1-29	35.	**d**, 1-30-1-32	36.	**c**, 1-2-1-3
37.	**c**, 1-40-1-42	38.	**b**, 1-4	39	**d**, 1-17
40.	**a**, 1-21	41.	**a**, 1-28-1-30	42.	**c**, 1-43, 1-60
43.	**c**, 1-45	44.	**e**, 1-45	45.	**d**, 1-65

SECTION II

For each of the following numbered items in the left-hand column, choose the most correct lettered items from the right-hand column that best applies:

1.	Homoiotherms.	(*a*) Behaves like warm-blooded animals except in winter.
2.	Poikilotherms.	(*b*) Deliberate reduction of body temperature.
3.	Hibernants.	(*c*) Who can maintain their body temperature constant in the face of wide variations of the environmental temperature.
4.	Core temperature.	(*d*) Body temperature between 99°F. and 105°F. and onwards.
5.	Shell temperature.	(*e*) Temperature of intra-abdominal, intrathoracic and intracranial contents.
6.	Pyrexia:	(*f*) Temperature of limbs and surface layer of the trunk.
7.	Hypothermia.	(*g*) Whose temperatures fluctuates with the fluctuation of the environmental temperature.

8. **Among the organs largest amount of heat is produced by:**
   (*a*) Brain.
   (*b*) Liver.
   (*c*) Intestine.
   (*d*) Heart.
   (*e*) None of these.

9. **Physiological response due to pyrexia is:**
   (*a*) Decreased metabolism.
   (*b*) Fall of blood pressure, pulse rate and cardiac output.
   (*c*) Positive nitrogen balance.
   (*d*) Rise of plasma chloride level.
   (*e*) None of these.

10. **Among the body tissues largest amount of heat is produced by:**
    (*a*) Subcutaneous tissues.
    (*b*) Adipose tissues.
    (*c*) Skeletal muscle.
    (*d*) Blood.
    (*e*) None of these.

11. **After a prolonged hot bath:**
    (*a*) Temperature falls rapidly below normal.
    (*b*) No effect on body temperature is observed.
    (*c*) Body temperature remains elevated for a considerable time.
    (*d*) Vasoconstriction occurs.
    (*e*) None of these.

From the following directions given below, select answers for questions 12–15:

(*a*) If statements *i*, *ii*, *iii* are all correct.
(*b*) If statements *i* and *iii* are correct.
(*c*) If statements *ii* and *iv* are correct.
(*d*) If statement *iv* only is correct.
(*e*) If all the statements are correct.

12. **Nervous system controls thermotaxis:**
(*i*) Heat-regulating centre lies in the medulla.
(*ii*) Greater part of the generalised thermal responses in the visceral effectors is due to sympathetic control.
(*iii*) Cooling of the carotid artery blood causes sweating, cutaneous vasodilatation and increased respiration.
(*iv*) Shivering centre is situated in the posterior part of the hypothalamus.

13. **Many factors affect the body temperature:**
(*i*) Protein foods raise body temperature.
(*ii*) Body temperature is above normal in old age.
(*iii*) 25 per cent. of muscular energy is converted into mechanical work and the rest comes out as heat.
(*iv*) The colour of human skin has profound effect upon the degree of heat loss by radiation.

14. **These are four principal mechanisms for physical heat regulation.**
(*i*) 55% of body heat is lost by radiation.
(*ii*) 20% of body heat is lost by conduction and convection.
(*iii*) 25% of heat is lost by evaporation.
(*iv*) 15% of heat is lost for warming the inspired air.

15. **For practical advantage, mouth temperature is taken as clinical purposes:**
(*i*) Mouth temperature at 5 p.m. is higher than at 5 a.m. in day-workers.
(*ii*) Mouth temperature is higher than rectal temperature.
(*iii*) Axillary temperature is 1°F. less than mouth temperature.
(*iv*) Emotional disturbance has no influence on body temperature.

From the following directions given below, select answers for questions 16–21:

(*a*) If the statement is correct and the reason is also correct.
(*b*) If the statement is correct but the reason is wrong.
(*c*) If the statement is wrong but the reason is correct.
(*d*) If both statement and the reason are incorrect.

16. Woollen clothes decrease heat loss through conduction, *because* woollen clothes are bad conductors of heat.

17. High but dry atmospheric temperature is better tolerated by a person than high humid temperature, *because* evaporation decreases to a great extent if the humidity of the atmosphere is high.

18. Stimulation of the anterior part of the hypothalamus helps in heat production, *because* the anterior part of hypothalamus contains the centre which governs the heat production.

19. Lesions of the posterior part of the hypothalamus lead to subnormal body temperature, *because* response to reduced temperature is controlled by the anterior part of the hypothalamus.

20. On entering a warm room after having been in the cold, a person may start shivering *because* of inexplicable phenomenon.

21. In a woman body temperature gradually rises and becomes maximum during menstruation *because* of high progesterone level of blood during menstruation.

Select respective answer, in each case, for the above question from the following references of the text:

Q. No.	Ref. Page(s)	Q. No.	Ref. Page(s)	Q. No.	Ref. Page(s)
1.	2-1	2.	2-1	3.	2-1
4.	2-1	5.	2-1	6.	2-9
7.	2-9	8.	2-4, 2-5	9.	2-9
10.	2-3	11.	2-2	12.	c, 2-5, 2-6, 2-7
13.	b, 2-2, 2-4	14.	a, 2-4, 2-5	15.	b, 2-1, 2-2
16	a, 2-4	17.	a, 2-5	18.	d, 2-6
19.	b, 2-5	20.	b, 2-9	21.	d, 2-2

SECTION III

For each of the following numbered items on the left-hand column, choose the most correct lettered items from the right-hand column that best applies:

1.	Bicarbonate buffers.	(*a*) Sodium bicarbonate concentration of blood not combined with non-volatile acid (NVA).
2.	Phosphate buffers.	(*b*) Pathochemical condition resulting from primary loss of base.
3.	Alkali reserve.	(*c*) Directly linked up with respiration.
4.	Acidosis.	(*d*) Work in co-operation with the kidneys.
5.	Alkalosis.	(*e*) Retention of large amount of fluid in the body.
6.	Hyperchloraemic acidosis.	(*f*) Pathochemical condition resulting from primary loss of acid.
7.	Dilution acidosis.	(*g*) Ureterosigmoidostomy.

8. **Metabolic acidosis may be brought about by:**
   (*a*) Loss of CO_2 by increased ventilation.
   (*b*) Retention of CO_2 brought about by respiratory obstruction.
   (*c*) Pyloric stenosis.
   (*d*) Methyl alcohol poisoning.
   (*e*) None of these.

9. **Respiratory acidosis may be brought about by:**
   (*a*) Emphysema.
   (*b*) Barbiturate overdose.
   (*c*) Respiratory obstruction.
   (*d*) Chest injuries.
   (*e*) All of these.

10. **Metabolic alkalosis may be brought about by.**
    (*a*) Prolonged hypotension leading to poor tissue perfusion.
    (*b*) High altitude.
    (*c*) High intestinal obstruction.
    (*d*) Diabetes mellitus.
    (*e*) None of these.

11. **Respiratory alkalosis may be brought about by:**
    (*a*) Diarrhoea.
    (*b*) Cardiac arrest.
    (*c*) Excess of alkali intake.
    (*d*) Renal failure.
    (*e*) Voluntary hyperapnoea.

12. **Main buffers of blood are:**
    (*a*) Potassium and sodium.
    (*b*) Bicarbonates, plasma proteins, haemoglobin and phosphates.
    (*c*) Bicarbonates only.
    (*d*) γ-globulin, carbohydrates, fats.
    (*e*) None of these.

13. **As blood passes through systemic capillaries:**
(*a*) Its pH rises.
(*b*) HCO_3^- passes from the red cells to the plasma.
(*c*) Concentration of chloride ions in the red cells falls.
(*d*) Oxygen dissociation curve shifts to the left.
(*e*) K^+ ions come out of the cells.

14. **Buffer is a**
(*a*) Mixture of weak acid and its salt with strong base.
(*b*) Mixture of a strong acid and its salt with strong base.
(*c*) Mixture of a strong acid and a weak acid.
(*d*) Mixture of a strong base and a weak base.
(*e*) None of these.

15. **Sodium bicarbonate/carbonic acid ratio in plasma is:**
(*a*) 20 : 1
(*b*) 4 : 1
(*c*) 50 : 1
(*d*) 1 : 20
(*e*) 1 : 100

16. **Respiration acts as the chief process for maintaining the pH of the body fluid constant by:**
(*a*) Elimination of ammonia.
(*b*) Elimination of phosphates.
(*c*) Changing dissolved CO_2 content of plasma.
(*d*) Elimination of non-volatile acid (NVA).
(*e*) None of these.

17. **In respiratory alkalosis:**
(*a*) pCO_2 falls below 35 mm of Hg.
(*b*) pCO_2 rises above 35 mm of Hg.
(*c*) pCO_2 remains the normal.

18. **Carbonic anhydrase is present in high concentration in:**
(*a*) W.B.C. (*c*) Plasma.
(*b*) Renal tubular cells.

19. **In compensated metabolic acidosis:**
(*a*) pCO_2 rises above 35 mm of Hg.
(*b*) pCO_2 falls below 35 mm of Hg.
(*c*) pCO_2 remains the same normal.

20. **pH of urine depends upon:**
(*a*) The ratio of sodium bicarbonate to carbonic acid.
(*b*) The ratio of sodium chloride to ammonium chloride.
(*c*) The ratio of Na_2HPO_4 to NaH_2PO_4.
(*d*) All of these.
(*e*) None of these.

From the following directions given below, select answers for questions 21-23:
(*a*) If *i* is greater than *ii*.
(*b*) If *ii* is greater than *i*.
(*c*) If *i* and *ii* are equal or very nearly equal.

21. (*i*) pCO_2 in uncompensated metabolic acidosis.
(*ii*) pCO_2 in compensated metabolic acidosis.

22. (*i*) Buffering capacity of plasma proteins.
    (*ii*) Buffering capacity of haemoglobin.
23. (*i*) pCO_2 in respiratory acidosis.
    (*ii*) pCO_2 in normal individual.

From the following directions given below, select answers for questions 24–26:

(*a*) If the statement and the reason are correct.
(*b*) If the statement is correct but the reason is wrong.
(*c*) If the statement is wrong but the reason is correct.
(*d*) If both the statement and the reason are incorrect.

24. Oxyhaemoglobin is more acidic than reduced haemoglobin, *because* 1 mMol of reduced haemoglobin can accept 0·7 mMol of hydrogen ion without change of blood reaction.
25. In metabolic acidosis the respiration will be depressed, *because* in metabolic acidosis the respiratory centre is depressed.
26. Methyl alcohol even in small amount may cause profound metabolic acidosis, *because* methyl alcohol is converted into acetic acid.

Select respective answer, in each case, for the above question from the following references of the text:

Q. No.	Ref. Page(s)	Q. No.	Ref. Page(s)	Q. No.	Ref. Page(s)
1.	3-2	2.	3-2	3.	3-2
4.	3-5	5.	3-5	6.	3-7
7.	3-7	8.	3-9	9.	3-6
10.	3-9	11.	3-9	12.	3-3
13.	3-6	14.	3-1	15.	3-2
16.	3-3	17.	3-9	18.	3-2
19.	3-9	20.	3-4	21.	a, 3-9
22.	b, 3-3	23.	a, 3-3	24.	a, 3-3
25.	d, 3-9	26.	b, 8-7		

1. **Average weight of the pituitary gland is:**
   (*a*) 0·1 gm.
   (*b*) 0·5 gm.
   (*c*) 1 gm.
   (*d*) 5 gm.
   (*e*) 10 gm.

2. **Anterior lobe of pituitary gland consists of:**
   (*a*) Pars distalis and pars tuberalis.
   (*b*) Pars distalis and pars nervosa.
   (*c*) Processus infundibuli and median eminence.
   (*d*) Pars nervosa and tuber cinereum.
   (*e*) None of these.

3. **Pars distalis forms about:**
   (*a*) 15% of the hypophysis.
   (*b*) 25% of the hypophysis.
   (*c*) 45% of the hypophysis.
   (*d*) 55% of the hypophysis.
   (*e*) 75% of the hypophysis.

4. **Hypothalamic releasing factors (RF) which control the secretory function of the anterior pituitary reach the anterior pituitary** *via*:
   (*a*) CSF.
   (*b*) Internal carotid artery.
   (*c*) Hypothalamico-hypophyseal portal system.
   (*d*) Circle of Willis.
   (*e*) Cavernous sinus.

5. **Atrophy of the anterior pituitary in infants and children produces:**
   (*a*) Dwarfism.
   (*b*) Gigantism.
   (*c*) Acromegaly.
   (*d*) Mongolism.
   (*e*) All of the above.

6. **Which of the following inhibits growth hormone secretion from the anterior pituitary:**
   (*a*) Insulin.
   (*b*) ACTH.
   (*c*) Thyroxine.
   (*d*) Oestrogen.
   (*e*) None of the above.

7. **Of the following which has got both activating and inhibiting effects on ACTH secretion:**
   (*a*) Hippocampus.
   (*b*) Amygdala.
   (*c*) Midbrain.
   (*d*) Peripheral nerves and spinal cord.
   (*e*) Cerebral cortex.

8. **Of the following which is secreted by the acidophil cells of the anterior pituitary:**
   (*a*) HGH.
   (*b*) TSH.
   (*c*) ACTH.
   (*d*) FSH.
   (*e*) ICSH.

9. **Vasopressin is synthesised in:**
   (*a*) Posterior pituitary.
   (*b*) Anterior pituitary.
   (*c*) Hypothalamic nuclei.
   (*d*) Cerebral cortex.
   (*e*) Medulla oblongata.

10. **ADH stimulates reabsorption of water by:**
    (*a*) Bowman's capsule.
    (*b*) Proximal convoluted tubule.
    (*c*) Loop of Henle.
    (*d*) Distal convoluted tubule.
    (*e*) None of these.

11. **In an extreme case of diabetes insipidus maximum output of urine may be as high as:**
    (*a*) 20 litres.
    (*b*) 40 litres.
    (*c*) 60 litres.
    (*d*) 120 litres.
    (*e*) 170 litres.

12. **Human thyroid gland stores:**
    (*a*) 0·5 mgm of iodine per gram of the dry gland.
    (*b*) 2 mgm of iodine per gram of the dry gland.
    (*c*) 5 mgm of iodine per gram of the dry gland.
    (*d*) 10 mgm of iodine per gram of the dry gland.
    (*e*) No iodine at all.

13. **The thyroid gland contains about:**
    (*a*) 1% of the total iodine content of the body.
    (*b*) 5% of the total iodine content of the body.
    (*c*) 10% of the total iodine content of the body.
    (*d*) 20% of the total iodine content of the body.
    (*e*) No iodine at all.

14. **Propylthiouracil is an antithyroid compound and its mechanism of action:**
    (*a*) Interferes in iodination of tyrosine.
    (*b*) Inhibits concentration of iodide within the gland.
    (*c*) Prevents absorption of iodine from intestine.
    (*d*) Forms of progoitrin and goitrin.
    (*e*) Decreases vascularity of the gland.

15. **Secretion of parathormone is controlled by:**
    (*a*) Anterior pituitary. (*b*) Posterior pituitary. (*c*) Hypothalamus.
    (*d*) Blood calcium level. (*e*) All of them.

16. **Which of the following stimulates insulin secretion:**
(*a*) GH (STH).
(*b*) Vagal stimulation.
(*c*) Cyclic 3′,5′-AMP.
(*d*) All of them.
(*e*) None of them.

17. **Which of the following inhibits insulin secretion:**
(*a*) Epinephrine.
(*b*) Vasopressin.
(*c*) Glucagon.
(*d*) Glucocorticoids.
(*e*) All of them.

18. **Glucagon secretion is inhibited by:**
(*a*) Hypoglycaemia.
(*b*) Hyperglycaemia.
(*c*) Muscular exercise.
(*d*) Pancreozymin.
(*e*) Protein meals.

19. **Which of the following diminishes blood sugar level:**
(*a*) Glucocorticoids.
(*b*) ACTH.
(*c*) Thyroxine.
(*d*) Stimulation of right vagus.
(*e*) Sympathetic stimulation.

20. **Maximum rate of removal of sugar from blood by the tissues is:**
(*a*) 0·5 gm/Kg/hour.
(*b*) 2 gm/Kg/hour.
(*c*) 5 gm/Kg/hour.
(*d*) 20 gm/Kg/hour.
(*e*) None of the above.

21. **Features of hypoglycaemia include:**
(*a*) Tremors. (*b*) Flushing, palor and perspiration. (*c*) Delirium, coma and convulsion. (*d*) Loss of deep reflexes. (*e*) All of them.

From the following directions given below, select answers for questions 22–40.
(*a*) If statements *i*, *ii* and *iii* are correct.
(*b*) If statements *i* and *iii* are correct.
(*c*) If statements *ii* and *iv* are correct.
(*d*) If the statement *iv* is only correct.

22. **Developmentally the pituitary gland has two parts—adenohypophysis and neurohypophysis:**
(*i*) Adenohypophysis consists of pars distalis, pars intermedia and pars tuberalis.
(*ii*) Adenohypophysis develops from primitive buccal cavity.
(*iii*) Neurohypophysis develops from the floor of the III ventricle.
(*iv*) The stalk of the Rathke's pouch persists in adult life and forms the pituitary stalk.

23. **Administration of growth hormone:**
   (*i*) Increases protein synthesis.
   (*ii*) Increases amino acid content of plasma.
   (*iii*) Increases plasma level of NEFA (non-esterified fatty acids).
   (*iv*) Produces hypoglycaemia.

24. **After hypophysectomy:**
   (*i*) Thyroid takes up more inorganic iodide from the plasma.
   (*ii*) Increases the vascularity of the thyroid gland.
   (*iii*) Increases the thyroid acinar cell height.
   (*iv*) Acini contain larger amount of colloid.

25. **ACTH is secreted by the basophil cells of the anterior pituitary:**
   (*i*) It is glycoprotein in nature.
   (*ii*) It has been isolated in α- and β-forms.
   (*iii*) It is destroyed at a temperature of 60°C.
   (*iv*) It controls the growth of adrenal cortex.

26. **Administration of ACTH produces:**
   (*i*) Increased excretion of potassium.
   (*ii*) Retention of sodium.
   (*iii*) Elevation of blood sugar.
   (*iv*) Increase in circulatory eosinophils.

27. **Degeneration of anterior pituitary is characterised by:**
   (*i*) Sterility. (*ii*) Extreme weakness. (*iii*) Hypoglycaemia.
   (*iv*) Increased urinary excretion of 17-ketosteroids.

28. **Melanocyte-stimulating hormone:**
   (*i*) It is same as melatonin.
   (*ii*) It is secreted by pars tuberalis of anterior pituitary.
   (*iii*) Hydrocortisone (Cortisol F) stimulates secretion of MSH.
   (*iv*) Epinephrine and norepinephrine inhibit the action of MSH.

29. **Oxytocin shares some of the activities of ADH and thus it is:**
   (*i*) Minimally antidiuretic.
   (*ii*) Causes contraction of uterus.
   (*iii*) Causes contraction of smooth muscles of mammary glands.
   (*iv*) Increases vasoconstriction and peripheral resistance.

30. **Iodine remains in blood in two forms—inorganic iodide and protein-bound iodine:**
   (*i*) Normal level of inorganic iodide in blood varies between 0·5 mgm and 1 mgm/100 ml.
   (*ii*) Normal level of PBI is 5 to 8 μgm/100 ml.
   (*iii*) In hyperthyroidism PBI level diminishes and may become as low as 0·5 μgm/100 ml.
   (*iv*) This iodine (PBI) may be precipitated out.

31. **Normal adult thyroid gland secretes about 1 mgm of thyroxine per day:**
   (*i*) Each mgm of thyroxine raises the B.M.R. to about 1000 calories.
   (*ii*) Thyroxine increases oxygen consumption of the brain tissue.
   (*iii*) Thyroxine promotes gluconeogenesis.
   (*iv*) Thyroxine cannot accelerate the rate of a denervated heart.

32. Thyroid gland concentrates iodide:
(*i*) This is an active process.
(*ii*) Uptake of iodide by the gland is inhibited by TSH.
(*iii*) Uptake of iodide is also inhibited by cyanide.
(*iv*) The iodide directly combines with tyrosine without being oxidised.

33. Thyrocalcitonin lowers plasma calcium and phosphate:
(*i*) It is secreted by the parathyroid glands.
(*ii*) It is detected in blood when blood calcium level is above normal.
(*iii*) Secretion of thyrocalcitonin is under control of pituitary hormones.
(*iv*) Hypocalcaemic action of the hormone is due to inhibition of bone resorption and calcium release.

34. In a case of manifest tetany in man:
(*i*) There is an increased neuromuscular irritability.
(*ii*) Urinary excretion of calcium and phosphorus is reduced.
(*iii*) Carpopedal spasm, Chvostek's signs and Erb's sign may be elicited.
(*iv*) Lowering of total calcium is more important than lowered ionic calcium in its causation.

35.. Active principal of parathyroid is parathormone:
(*i*) Parathormone remains stored in the parathyroid gland.
(*ii*) It increases rate of bone resorption with consequent mobilisation of calcium and phosphate.
(*iii*) It increases reabsorption of phosphate and inhibits reabsorption of calcium by renal tubules.
(*iv*) The action of PTH on bone and kidneys is stimulated by adenyl cyclase.

36. Calcium constitutes about 2% of total body weight:
(*i*) Absorption of calcium mainly takes place in the terminal part of ileum and caecum.
(*ii*) Organic calcium is better absorbed than inorganic calcium.
(*iii*) High phosphorus-containing foods help calcium absorption.
(*iv*) Vitamin D is essential for calcium absorption in man.

37. Phosphorus is present in all tissues of the body:
(*i*) Calcium/inorganic phosphorus ratio in blood on the average 2 : 1.
(*ii*) Anything that raises serum calcium level also raises phosphate level proportionally.
(*iii*) Acidity and bile salts favour phosphate absorption.
(*iv*) Vitamin D stimulates phosphate transport and fatty acids in food diminish phosphate absorption.

38. The chemical structure of insulin:
(*i*) Is such that it is effective when taken by mouth.
(*ii*) Is three chains of amino acids linked by disulphide bonds.
(*iii*) Is same as proinsulin.
(*iv*) Is rich in cysteine, leucine and glutamic acid.

39. **Insulin is synthesised by the ribosomes of β-cells of the islets of Langerhans as β-granules:**
   (*i*) These β-granules remains enclosed within a membranous sac.
   (*ii*) These β-granules are liberated into the extracellular space of the islets of Langerhans by a process known as emiocytosis.
   (*iii*) This process requires the help of calcium ion.
   (*iv*) The insulin thus released from the β-cells reached the blood flow and tissues as zinc-insulin.

40. **Glucagon is secreted by α-cells of the islets of Langerhans:**
   (*i*) It is polypeptide in nature.
   (*ii*) It has been synthesised in laboratory.
   (*iii*) It is also present in the mucosa of stomach and duodenum.
   (*iv*) Its mode of action is unknown.

For the numbered items on the left-hand column, choose a correct lettered item from the right-hand column that best applies:

41.	Steroid feedback mechanism.	(*a*) Blood level of ACTH contents the endogenous secretion of ACTH.
42.	Short feedback mechanism.	(*b*) Responsible for lactation in the post-partum women.
43.	LH.	(*c*) Controls the activity and growth of gonads.
44.	LTH.	(*d*) Blood level of steroid corticoids controls the secretion of ACTH.
45.	Chvostek's sign.	(*e*) Tapping of the facial nerve near the styloid process causes facial spasm.
46.	Erb's sign.	(*f*) Increased excitability of motor nerves to galvanic current.
47.	α-cells of pancreas.	(*g*) Secrete gastrin.
48.	β-cells of pancreas.	(*h*) Secrete glucagon.
49.	δ-cells of pancreas.	(*i*) Secrete insulin.

From the following directions given below, select answers for questions 50–58:
   (*a*) If the statement is correct and the reason is also correct.
   (*b*) If the statement is correct but the reason is wrong.
   (*c*) If the statement is wrong but the reason is correct.
   (*d*) If both the statement and the reason are incorrect.

50. Hypophysectomy accelerates the growth of the gonads, *because* hypophysectomy controls gonads.
51. Lactation does not occur during pregnancy, *because* placental gonadotrophins inhibit prolactin secretion.
52. ADH reduces chloride loss in urine, *because* it increases chloride absorption.
53. In man oxytocin acts on uterus in late pregnancy, *because* high proportion of oestrogen during this period makes the uterine muscles more sensitive to oxytocin.
54. A high acidity favours calcium absorption, *because* the calcium salts become soluble in acid medium.

55. Alkalaemia may produce symptoms of hypocalcaemia, *because* alkalaemia decreases total serum calcium.

56. Normal pancreatic tissue is rich in Zn, *because* insulin remains stored in it as a Zn salt.

57. In advanced diabetes RQ is about 0·7, *because* in absence of insulin in this condition mostly fats are burnt.

58. Hypoglycaemia affects the nerve cells last, *because* nerve cells do not use sugar as the source of energy.

For the following questions 59 to 76 a statement is followed by four possible answers. Answer by using the key outlined below:

(*a*) If only *i*, *ii* and *iii* are correct.
(*b*) If only *i* and *iii* are correct.
(*c*) If only *ii* and *iv* are correct.
(*d*) If only *iv* is correct.
(*e*) If all *i*, *ii*, *iii* and *iv* are correct.

59. **Adrenal gland:**
(*i*) Adrenal gland in foetus and in neonates are proportionally larger than in the adult.
(*ii*) Foetal adrenal cortex consists of provisional and permanent cortex which are functionally and structurally the same.
(*iii*) One of the major functions of foetal adrenal is to secrete sulphate conjugates of androgens, which become converted into active androgens and oestrogens in the placenta.
(*iv*) Adrenal cortex is ectodermal in origin.

60. **Adrenal gland:**
(*i*) Accessory adrenal cortical tissues are more abundant than accessory medullary tissues in man.
(*ii*) The blood vessels of adrenal gland enters it through the surface.
(*iii*) The nerve fibres enter the gland through the hilus and control both the medulla and the cortex.
(*iv*) The nerve fibres of the adrenal glands are medullated and are entirely preganglionic.

61. **Adrenal cortex:**
(*i*) Histologically adrenal cortex consists of three well-defined layers—zona fasciculata, zona glomerulosa and zona reticularis from inside outwards.
(*ii*) Zona glomerulosa secretes mainly aldosterone, and small amount of glucocorticoids and sex hormones.
(*iii*) Zona reticularis secretes mainly sex hormones and a small amount of aldosterone but no glucocorticoids.
(*iv*) Zona fasciculata is the widest layer, rich in ascorbic acid and cholesterol, and secretes glucocorticoids.

62. **Adrenal steroid:**
(*i*) Biosynthesis of adrenal steroids takes place in the mitochondria.
(*ii*) Cyclic AMP is necessary for biosynthesis of steroid hormones.
(*iii*) ACTH is involved in steroidogenesis.
(*iv*) NADPH acts as coenzyme for hydroxylation reaction in different steps.

63. **Adrenal steroids:**
(*i*) Normally adrenal steroid hormones circulate in free and bound forms.
(*ii*) Major parts of the steroid hormones remain free in circulation.
(*iii*) α-globulins bind glucocorticoids and β-globulins bind sex hormones.
(*iv*) The bound hormone is essentially the active form.

64. **Cortisol has many functions in the body:**
(*i*) It favours protein synthesis.
(*ii*) It helps absorption of calcium from the gut.
(*iii*) It enhances formation of antibodies.
(*iv*) It reduces blood without affecting the marrow eosinophil count.

65. **Hormones of the adrenal medulla are called catecholamines:**
(*i*) Catecholamines are formed from the amino acid phenylalanine.
(*ii*) Catecholamines are released from the adrenal medulla by a process known as exocytosis.
(*iii*) Catecholamine responses are mediated by intracellular level of cyclic AMP.
(*iv*) Catecholamines are metabolised by enzyme mono-amino-oxidase (MAO) and catechol-O-methyl transferase (COMT).

66. **Epinephrine differs from norepinephrine in that it:**
(*i*) Causes tachycardia.
(*ii*) Dilates some vessels, e.g., coronary vessel and skeletal muscle.
(*iii*) Inhibits movement of uterus in advanced pregnancy.
(*iv*) Respiration is inhibited.

67. **A patient with a secreting tumour of the adrenal medulla (pheochromocytoma) may have:**
(*i*) Paroxysmal or permanent hypertension.
(*ii*) Hypoglycaemia.
(*iii*) Dyspnoea, sweating, tremors.
(*iv*) Decreased B.M.R. and oxygen consumption.

68. **Adrenal insufficiency causes:**
(*i*) Increased blood volume.
(*ii*) Decreased plasma K level.
(*iii*) Hyperglycaemia.
(*iv*) Excretion of 17-ketosteroids is much diminished.

69. **Almost each tissue contains small amount of prostaglandins. They are:**
(*i*) A class of C_{20} fatty acids.
(*ii*) Regarded as local tissue hormones and regulate action of neurohormones.
(*iii*) Inhibitors of lipolysis.
(*iv*) Potent vasodilators.

70. **Males differ from females in that their:**
(*i*) Two sex chromosomes are different (XY).
(*ii*) Urine contains only male hormone.
(*iii*) Limit of sex life is not sharp.
(*iv*) Pubic hairs are concave forwards.

71. Human spermatozoa:
(*i*) Require temperature lower than that of the interior of body for their genesis.
(*ii*) They are motile even when in the seminiferous tubules.
(*iii*) Take about 45 minutes to pass from the opening of the cervix to the ovarian end of the Fallopian tube.
(*iv*) In absence of fertilisation they die within 24 hours in the Fallopian tube.

72. Fertilisation of human ovum:
(*i*) Penetration of the ovum by the sperm is brought about by a lysosomal enzyme present in the tail of the sperm.
(*ii*) Only one sperm is allowed to penetrate the ovum.
(*iii*) May occur one week after ovulation.
(*iv*) Usually occurs at the ampullary-isthmic junction of the Fallopian tube.

73. In normal menstrual cycle:
(*i*) Ovulation is associated with rise in blood LH level.
(*ii*) LH and LTH are directly responsible for premenstrual changes of the endometrium.
(*iii*) In absence of fertilisation high level of progesterone inhibits LH and LTH secretion which in turn causes involution of the corpus luteum.
(*iv*) High level of progesterone is also the direct cause of menstrual bleeding.

74. During pregnancy:
(*i*) Uterine muscle tissue increases mainly due to hyperplasia of uterine muscle fibres.
(*ii*) Blood volume increases.
(*iii*) Vital capacity, tidal volume and pulmonary ventilation decrease due to raised diaphragm.
(*iv*) Cardiac output increases.

75. In the placenta:
(*i*) There is free mixing of maternal and foetal blood.
(*ii*) The pO_2 of umbilical vein blood is same as the pO_2 in the maternal sinusoid.
(*iii*) pO_2 of blood in the maternal sinusoid is same as alveolar air O_2 tension.
(*iv*) Adequate oxygenation takes place *because* foetal haemoglobin has the property of taking up oxygen at relatively low oxygen pressure.

76. Foetal circulation differs from an adult in that blood in:
(*i*) Brachial artery has a higher oxygen saturation than the femoral artery.
(*ii*) Inferior vena cava has higher oxygen saturation than superior vena cava.
(*iii*) Major part of the blood from right ventricle passes *via* ductus arteriosus in the descending aorta.
(*iv*) In the left atrium oxygen saturation is higher than the right atrium.

77. **Glucocorticoids contain:**
(*a*) 17 carbon atoms.
(*b*) 18 carbon atoms.
(*c*) 19 carbon atoms.
(*d*) 20 carbon atoms.
(*e*) 21 carbon atoms.

78. **Sex steroids contain:**
(*a*) 17 carbon atoms.
(*b*) 19 carbon atoms.
(*c*) 21 carbon atoms.
(*d*) 23 carbon atoms.
(*e*) None of these.

79. **Cortisol level in plasma is 3–15 ngm/100 ml. It is:**
(*a*) Higher in early morning.
(*b*) Very low in early morning.
(*c*) Higher near midnight.
(*d*) Almost the same in early morning and midnight.
(*e*) None of the statements is correct.

80. **Aldosterone controls mineral metabolism, it increases the reabsorption of:**
(*a*) NaCl.
(*b*) Bicarbonate.
(*c*) Potassium.
(*d*) Phosphate.
(*e*) (*a*) and (*b*).

81. **Action of glucocorticoids on carbohydrate metabolism is partly similar and partly antagonistic to insulin: which of the actions are antagonistic to insulin:**
(*a*) Increases gluconeogenesis in the liver.
(*b*) Depresses glucose uptake and oxidation by tissues.
(*c*) Stimulates formation of glycogen in the liver.
(*d*) (*a*) and (*b*).
(*e*) (*c*) and (*d*).

82. **Conn's syndrome (primary hyperaldosteronism) is associated with adrenal tumour and is characterised by:**
(*a*) Muscular weakness.
(*b*) Hypertension.
(*c*) Retention of sodium.
(*d*) Alkalosis.
(*e*) All of them.

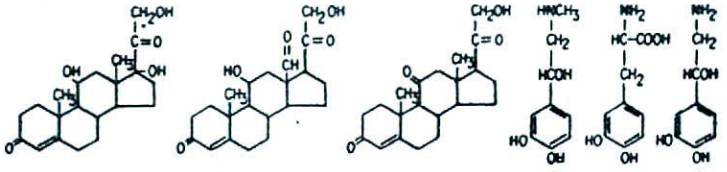
83. **Normal urinary excretion of neutral 17-ketosteroids in 24 hours in adult male is approximately:**
(*a*) 1 to 5 mgm.
(*b*) 5 to 15 mgm.
(*c*) 10 to 20 mgm.
(*d*) 15 to 25 mgm.
(*e*) 20 to 30 mgm.

84. **Secretion of aldosterone is controlled by a chemical mediator known as glomerulotrophin. It is liberated from:**
   (*a*) Hypothalamus.
   (*b*) Anterior pituitary.
   (*c*) Posterior pituitary.
   (*d*) Juxtaglomerular cells.
   (*e*) None of these.

85. **Melatonin is a hormone secreted by:**
   (*a*) Anterior pituitary.
   (*b*) Posterior pituitary.
   (*c*) Hypothalamus.
   (*d*) Pineal body.
   (*e*) Sympathetic nerve endings.

For the chemical compounds, from questions 86–91, choose the appropriate structural formulae:

86. 11-dehydrocorticosterone.
87. Cortisol F (hydrocortisone).
88. Aldosterone (aldehyde form).
89. Norepinephrine.
90. Epinephrine.
91. DOPA



For the questions 92–95, which of the following statement are correct:

92. **Intrauterine contraceptive device (IUCD):**
   (*a*) Prevents menstruation.
   (*b*) Inhibits ovulation.
   (*c*) Prevents fertilisation of the ovum.
   (*d*) Makes the intrauterine environment hostile to the nidation of the fertilised ovum.
   (*e*) The method is 100 per cent. successful.

93. **Ligation of Fallopian tube (tubectomy) results in:**
   (*a*) Stoppage of menstruation.
   (*b*) Stoppage of ovulation.
   (*c*) Decreased secretion of gonadotrophins.
   (*d*) Changes of the endometrium.
   (*e*) Unfertilised ovum is lost into the peritoneal cavity.

94. **Ligation of the vas deferens (vasectomy) causes:**
   (*a*) Virilisation.
   (*b*) Stoppage of spermatogenesis.
   (*c*) Deficiency of male hormones.
   (*d*) Loss of the erectile power of the penis.
   (*e*) None of the above.

95. Probable modes of action of a classical contraceptive are:

(*i*) Inhibition of ovulation.
(*ii*) Modifying tubal transport of the ovum.
(*iii*) Makes nidation of fertilised ovum difficult.
(*iv*) Render cervical mucous hostile to sperm penetration.
(*v*) All of the above.

Select respective answer, in each case, for the above questions from the following references of the text:

Q. No.	Ref. Page(s)	Q. No.	Ref. Page(s)	Q. No.	Ref. Page(s)
1.	4-13	2.	4-15	3.	4-15
4.	4-19	5.	4-21	6.	4-24
7.	4-29	8.	4-18	9.	4-47
10.	4-49—4-50	11.	4-50	12.	4-76
13.	4-76	14.	4-89—4-90	15.	4-97
16.	4-121—4-122	17.	4-121—4-122	18.	4-125
19.	4-130	20.	4-129	21.	4-130
22.	a, 9-14	23.	b, 4-21	24.	d, 4-25
25.	c, 4-27	26.	a, 4-28	27.	a, 4-42
28.	d, 4-44	29.	a, 4-54	30.	c, 4-76
31.	b, 4-77	32.	b, 4-71	33.	c, 4-91—4-92
34.	a, 4-98	35.	c, 4-95	36.	d, 4-100
37.	b, 4-104—4-105	38.	d, 4-110	39.	a, 4-111—4-112
40.	a, 4-123	41.	4-29	42.	4-30
43.	4-32	44.	4-33	45.	4-99
46.	4-99	47.	4-107	48.	4-107
49.	4-108	50.	c, 4-30	51.	a, 4-34
52.	d, 4-51	53.	a, 4-55	54.	a, 4-192
55	b. 4-101	56.	a, 4-110	57.	a, 4-182
58.	d, 4-130	59.	4-136	60.	4-136
61.	4-139, 4-140	62.	4-143—4-144	63.	4-144
64.	4-151, 4-157	65.	4-164—4-166	66.	4-173, 4-174
67.	4-176	68.	4-153	69.	4-182, 4-183
70.	4-196, 4-197, 4-219	71.	4-212—4-222	72.	4-237
73.	4-262, 4-263	74.	4-271	75.	4-278
76.	4-289	77.	4-142	78.	4-143
79.	4-145, 4-157	80.	4-149	81.	4-150
82.	4-155	83.	4-156	84.	4-158
85.	4-193	86.	c, 4-143	87.	a, 4-143
88.	b, 4-143	89.	f, 4-184, 4-173	90	d, 4-148, 4-168
91.	e, 4-184	92.	4-306	93.	1106, 4-306
94.	4-307	95.	4-306, 4-307		

SECTION V

For the following questions 1–22 a statement is followed by four possible answers. Answer by using the key outlined below:

(*a*) If only *i*, *ii* and *iii* are correct.
(*b*) If only *i* and *iii* are correct.
(*c*) If only *ii* and *iv* are correct.
(*d*) If only *iv* is correct.
(*e*) If all *i*, *ii*, *iii* and *iv* are correct.

1. **The spinal cord:**
   (*i*) Consists of 29 segments.
   (*ii*) Its length is equal to that of the vertebral column.
   (*iii*) The cord ends at the level of the fifth sacral vertebra.
   (*iv*) Dura and arachnoid proceed up to the second sacral vertebra.

2. **CSF:**
   (*i*) Is contained in subdural space.
   (*ii*) Surrounds the whole central nervous system being both inside and outside it.
   (*iii*) Comes out of the ventricles into the subarachnoid space by the aqueduct of Sylvius.
   (*iv*) The circulation of CSF is helped by the movement of the cilia lining the ventricles.

3. **Neurone:**
   (*i*) Is the structural and functional unit of the nervous system.
   (*ii*) Consists of nerve cell body, axon and dendrite.
   (*iii*) Axon carries impulses away from the nerve cell.
   (*iv*) Dendrite carries impulses towards the central nervous system and is devoid of any Nissl granules.

4. **A nerve fibre:**
   (*i*) Propagates impulse in one direction only.
   (*ii*) Will always give maximum response if the stimulus be adequate.
   (*iii*) Has high Na^+ concentration inside and high K^+ concentration outside in resting phase.
   (*iv*) Cannot be fatigued.

5. **The physiological properties of the nerve fibre vary with their diameter and medullation. Thicker the nerve fibres:**
   (*i*) Higher will be the impulse velocity.
   (*ii*) Lower will be the spike potential.
   (*iii*) Lower will be the refractory period.
   (*iv*) Higher will be the stimulus threshold (chronaxie).

6. **Metabolic changes are constantly going on in a nerve fibre:**
   (*i*) Metabolic activity is very high even at resting phase.
   (*ii*) During activity ATP and creatine phosphate break down and supply energy for propagation of the nerve impulse.
   (*iii*) During activity heat production by nerve fibres is even greater than skeletal muscle tissues.
   (*iv*) Increase in the strength of stimulus does not raise the heat production.

7. **In the region of myoneural junction:**
   (*i*) Axon terminal (sole foot) is devoid of any myelin sheath.
   (*ii*) There are many tiny vesicles and mitochondria.
   (*iii*) The acetylcholine is synthesised by the mitochondria and stored in the vesicles.
   (*iv*) For liberation of acetylcholine from the vesicle participation of Ca^{++} is required.

8. **When muscles degenerate:**
   (*i*) Anode-closing contraction is more than cathode-closing contraction (A.C.C > C.C.C.).
   (*ii*) Shows exaggerated response to Faradic stimulation.
   (*iii*) Slow worm-like contraction to galvanic stimulation.
   (*iv*) The reactions are called Wallerian degeneration.

9. **After complete transaction of a nerve the following changes take place in the nerve cell:**
   (*i*) Nissl granules increase.
   (*ii*) Golgi apparatus, mitochondria and neurofibrils break up and disappear.
   (*iii*) The cell becomes dehydrated.
   (*iv*) The nucleus is pushed to the periphery.

10. **After complete transection of a nerve the following changes take place in the distal end:**
   (*i*) The myelin sheath disintegrates into droplets of fat.
   (*ii*) Schwann cells multiply and fill up the gap between the two cut end (up to 3.cm).
   (*iii*) Regeneration of nerve fibre within central nervous system is not possible.
   (*iv*) A regenerated nerve is devoid of myelin sheath.

11. **Acetylcholine is produced at the motor end-plates:**
   (*i*) Intravenous injection of very small doses of acetylcholine causes paralysis of muscle.
   (*ii*) Action of acetylcholine is potentiated by choline esterase
   (*iii*) Prostigmine potentiates the action of choline esterase.
   (*iv*) Curare prevents the action of acetylcholine.

12. **Knee jerk:**
   (*i*) It is a monosynaptic reflex.
   (*ii*) Centre is situated in L. 5-S. 2.
   (*iii*) It is exaggerated in upper motor neurone lesions.
   (*iv*) Becomes pendular in lower motor neurone lesions.

13. **Sensory tracts in the posterior column are:**
   (*i*) Tract of Goll.
   (*ii*) Tract of Burdach.
   (*iii*) Comma tract of Schultze.
   (*iv*) Gowers' tract.

14. **Second-order neurones of the following sensory tract do not cross:**
   (*i*) Dorsal spinothalamic.
   (*ii*) Ventral spinothalamic.
   (*iii*) Spinotectal.
   (*iv*) Spinocerebellar.

15. **Pain sensation:**
   (*i*) Nerve endings for pain sensations are organs of Ruffini and Golgi-Mazzoni bodies.
   (*ii*) Pain is carried by fine non-medullated nerve fibres.
   (*iii*) Pain sensations are carried by the tract of Flechsig and Gowers.
   (*iv*) The tracts carrying pain sensation end in thalamus.

16. **Pyramidal tracts:**
   (*i*) The tracts are constituted by the fibres originating from the cells of the cerebellum.
   (*ii*) 60% fibres of the tracts are myelinated.
   (*iii*) Of all pyramidal fibres 20% only end in the cervical region.
   (*iv*) Pyramidal cells and their axons are known as upper motoneurone.

17. **Extrapyramidal tracts:**
   (*i*) When pyramidal tracts are damaged, extrapyramidal tracts may carry some of their functions.
   (*ii*) They are collectively responsible for tone, posture and equilibrium.
   (*iii*) The cortex exerts tonic inhibitory control over the lower centres through these tracts.
   (*iv*) They control complex movements of the body and limbs.

18. **Basal ganglia:**
   (*i*) Are the primitive motor cortex for voluntary muscular activity.
   (*ii*) Disease of basal ganglia produces muscular rigidity.
   (*iii*) Check abnormal involuntary movements.
   (*iv*) Control automatic and associated movements such as swinging of the arms during walking.

19. **The ascending reticular activating system:**
   (*i*) Is situated in the cerebral hemisphere.
   (*ii*) Stimulation of the system leads to sleep.
   (*iii*) It is depressed by epinephrine.
   (*iv*) Cerebral cortex stimulates this system.

20. **Muscle tone is:**
   (*i*) Purely reflex process.
   (*ii*) Lost when posterior nerve root is destroyed.
   (*iii*) Lost when motor nuclei in the anterior horn cells are destroyed.
   (*iv*) Preserved even when the nerve to the muscle is sectioned.

21. **Macula lutea (Fovea) is:**
   (*i*) Situated at the posterior pole of the eye.
   (*ii*) Devoid of stratum opticum, inner and outer plexiform layers, ganglion cell layer.
   (*iii*) Packed with highly developed long thin cones.
   (*iv*) Devoid of any rod and crossed by neumerous blood vessels.

22. **The cones in the eye:**
(*i*) Are concerned with colour vision.
(*ii*) Are not concerned with visual acuity.
(*iii*) They contain iodopsin.
(*iv*) Are numerous at the periphery of the retina.

From the numbered items, for questions 23-29, on the left-hand column choose the most appropriate lettered item from the right-hand column:

23.	Sensory unit.	(*a*) Crude parts of various cutaneous sensations.
24.	Dermatome.	(*b*) Ability to recognise the position and movement of limbs.
25.	Protopathic sensation.	(*c*) Finer aspect of cutaneous sensations.
26.	Epicritic sensation.	(*d*) Area supplied by one sensory fibre.
27.	Kinaesthetic sensation.	(*e*) Area of skin supplied by one posterior root.
28.	Meissner's corpuscle.	(*f*) Pressure receptor.
29.	Pacinian corpuscle.	(*g*) Touch receptor.

Select respective answer, in each case, for the above questions from the following references of the text:

Q. No.	Ref. Page(s)	Q. No.	Ref. Page(s)	Q. No.	Ref. Page(s)
1.	d, 5-5–5-6	2.	c, 5-8–5-10	3.	a, 5-12–5-13
4.	c, 5-24, 5-30	5.	b, 5-30	6.	c, 5-32
7.	e, 5-53–5-55	8.	b, 5-58	9.	c, 5-58
10.	a, 5-60	11.	d, 5-66	12.	b, 5-84–5-85
13.	a, 5-109	14.	d, 5-115	15.	c, 5-119–5-120
16.	c, 5-122–5-123, 5-126	17.	e, 5-137	18.	e, 5-180–5-181
19.	d, 5-186–5-188	20.	a, 5-192, 5-193	21.	d, 6-45
22.	b, 6-48, 6-50	23.	d, 5-92	24.	e, 5-92
25.	a, 5-95	26.	c, 5-95	27.	b, 5-97
28.	g, 5-67, 5-72	29.	f, 5-68, 5-72		

SECTION VI

UNITS AND MEASURES

1. **Some prefixes that are used for various units, but not used alone:**
mega = M = 10^6 kilo = k = 10^3 centi = c = 10^{-2} milli = m = 10^{-3}
micro = μ = 10^{-6} nano = n = 10^{-9} pico = p = 10^{-12}

2. **Mass**
gram = g, *or* gm kilogram = kg, *or* kgm milligram = mg, *or* mgm
microgram = μg millimicrogram, *or* nanogram = mμg, *or* ng
micromicrogram, *or* picogram = $\mu\mu$g, *or* pg
1 kg = 1000 g 1 g = 1000 mg = 1,000,000 μg
1 kilogram = 15,432 grains, *or* 35·274 ounces (avoir), *or* 2·20462 pounds
1 gram = 15·43236 grains, *or* 0·03527 ounce (avoir), *or* 0·00220 pound
1 milligram = 0·015432 grain 1 ounce (avoirdupois) = 28·350 g
1 lb = 453·59 g = 0·4536 kg 1 grain = 64·799 mg = 0·0648 g
1 ton = 1016 kg 1 tonne = t = 1000 kg = 0·984 ton

3. **Capacity or volume**
1 cubic millimetre = 1 mm^3 millilitre = ml litre l
1 **litre** is the volume of 1 kilogram of water at its maximum density (3·98°C.) and at 760 mm of Hg at atmospheric pressure.
1 millilitre (ml) = 16·894 minims
1 l = 1000 ml 1 = 35·196 fluid ounces
1 litre = 61·0239 $inches^2$ = 1·7598 pints (O) = 0·22 gallon (C)
1 pint = 20 fluid ounces (avoir) = 568 ml 1 c.c. = 0·061 $inch^3$
1 litre = 1·000027 cubic decimetres
Thus, 1 ml = 1·000027 cubic centimetres (c.c.)
The **cubic centimetre** is based on the standard of length, i.e., the metre, and is very nearly but not quite the same as the ml. However, ml and c.c. are usually treated as identical.
1 ml = 1000 μl 1 μl = 1·000028 mm^3
1 gallon = 4·551 l 1 gallon = 8 pints = 0·00455 m^3
1 cu. in. = 16·387 cm^3 1 cu. ft. = 0·028 m^3 = 28·32 l
1 cu. ft. water = 62·39 lb = 28·32 kg
1 fluid ounce = 8 fluid drachms (avoir) = 28·412 ml
1 fluid drachm or fl. dr. = 60 minims (avoir) = 3·5515 ml
1 minim = 0·059152 ml
1 pint (U.K.) = 0·568 litre 1 pint (U.S.A.) = 0·4544 litre
1 gallon (U.K.) = 4·546 litres 1 gallon (U.S.A.) = 3·651 litres

4. **Length**
metre = m centimetre = cm millimetre = mm micron = μm
millimicron = nm Angstrom unit = Å
1 m = 100 cm = 1000 mm = 10^6 μm = 10^9 mμ = 10^{10}Å
Å = 10^{-10} m = 0·1 nm 1 μm = 10^{-6} m = 1000 nm = 10000 Å
1 nm = 10^{-9} m = 10Å 1 in. = 2·5400 cm = 0·02540 m
1 cm = 0·394 inch 1 foot = 30·4800 cm
1 m = 39·370113 inches = 3·2808 feet 1 yd. = 0·9144 m
= 1·0936 yards 1 mile = 1760 yd. = 1·6093 km
1 km = 3281 feet = 0·6214 mile 1000 ft. = 0·3048 km
1 nautical mile = 1·852 km

5. **Area**

1 sq. in. = 645·16 mm^2 = 6·4516 cm^2 1 sq. ft. = 0·093 m^2
1 m^2 = 1·196 sq. yd. = 10·764 sq. ft.
1 sq. yd. = 0·836 m^2 1 hectare = 2·471 acres
1 acre = 4840 sq. yd. = 4047 m^2 = 0·4047 hectare
1 sq. mile = 640 acres = 2·59 km^2 = 259 hectacres

6. **Conversion**

To convert cm H_2O to mm of Hg, multiply by 0·736.

To convert grammes per 100 ml into grains per fluid ounce, multiply by 4·375.

To convert grammes into ounces (avoirdupois), multiply by 10 and divide by 283.

To convert litres into pints, multiply by 88 and divide by 50.

To convert kilos into pounds, multiply by 1000 and divide by 454.

To convert Fahrenheit into degree Celsius (Centigrade), substract 32, multiply the remainder by 5, and divide the result by 9.

To convert degree Celsius (Centigrade) into Fahrenheit, multiply by 9, divide by 5, and add 32.

The following table shows the relation of degrees Fahrenheit to degree Celsius (Centigrade) as far as is likely to be required in clinical work.

Celsius (Centigrade)	*Fahrenheit*
110°	230°
100	212
95	203
90	194
85	185
80	176
75	167
70	158
65	149
60	140
55	131
50	122
45	113
44	111·2
43	109·4
42	107·6
41	105·8
40·5	104·9
40	104·0
39·5	103·1
39	102·2
38·5	101·3
38	100·4
37·5	99·5
37°	98·6°

Celsius (Centigrade)	*Fahrenheit*
36·5°	97·7°
36	96·8
35·5	95·9
35	95·0
34	93·2
33	91·4
32	89·6
31	87·8
30	86
25	77
20	68
15	59
10	50
+5	41
0	32
−5	23
−10	14
−15	+5
−20	−4

0·54°	1°
1	1·8
2	3·6
2·5	4·5

To change	**to**	**multiply by**
millimetres	inches	0·03937
metres	inches	39·37
cubic metres	cubic yards	1·3079
litres	cubic inches	61·02
litres	ounces of water	35·275
inches	millimetres	25·4
feet	metres	0·3048
ounces	grams	28·35
centimetres	inches	0·3937
square centimetres	square inches	0·155
cubic centimetres	millilitres	1·0

To change	to	multiply by
cubic centimetres	cubic inches	0·061
cubic centimetres	grams of water	1·0
cubic centimetres	drops	12·0
feet	centimetres	30·48
square feet	square centimetres	929·0
cubic feet	ounces of water	999·0
gallons	litres	3·785
grams	ounces	0·035274
square inches	square centimetres	6·4516
cubic inches	cubic centimetres	16·387
cubic inches	pints	0·0346
cubic inches	grams of water	16·39
square metres	square centimetres	10.000·0
cubic metres	litres	1000·0
miles	kilometres	1·6094
square miles	square kilometres	2·59
pints	cubic centimetres	473·18
pints	ounces of water	16·69
pints	cups	2·0
pints	tablespoons	32·0
pints	teaspoons	96·0
quarts	tablespoons	64·0
quarts	teaspoons	192·0
quarts	kilograms of water	0·946
tablespoons	cups	0·0625
tablespoons	cubic centimetres	15·0
tablespoons	dessertspoons	1·5
tablespoons	teaspoons	3·0
tablespoons	drops	180·0
teaspoons	cubic centimetres	5·0
teaspoons	cups	0·02
teaspoons	drops	60·0

7. Density

The *système internationale* (SI) unit of density is the kilogram per cubic metre, kg per m^3

1 lb per $in.^3 = 2{\cdot}768 \times 10^4$ kg/m^3 1 lb per $ft.^3 = 16{\cdot}02$ kg/m^3

8. Pressure

1 atmosphere of pressure = 760 mm of Hg = 760 torr

= 29·92 in. Hg	= 29·92 in. Hg
= 1033 g wt per cm^2	= 10·33 metres water
= 14·70 lb/$in.^2$	= 33·9 ft. water
= 1013 millibars	= 1033·3 g/sq. in.
= 1013250 dynes/cm^2	= 14·7 lb/sq. in.
= 101·33 Nm^{-2}	= 2116·3 lb/sq. in.

1 mm H_2O = 98·06 dynes per cm^2 = 0·0736 mm of Hg

1 mm of Hg = 1333 dynes per cm^2 = 1 atmosphere ÷ 760 = 1 torr = 133·3 Nm^{-2}

1 $Nm^{-2} = 1{\cdot}019 \times 10^{-2}$ g per cm^2 1 bar = 750·062 mm of Hg

Pressure of 1 mm column of water = $7{\cdot}3554 \times 10^{-2}$ mm of Hg

1 mm column of Hg = $1{\cdot}3595 \times 10$ mm H_2O

1 lb per $in.^2 = 7{\cdot}031 \times 10^2$ kilopounds per m^2 = 6894 Nm^{-2}

1000 lb per $in.^2 = 0{\cdot}703$ kg per mm^2

1 millibar (1 mb) = 1000 dynes per cm^2

One **dyne** is the force which would produce an acceleration of 1 cm per sec. per sec. (i.e., 1 cm $sec.^{-2}$) if acting on 1 g.

1 dyne = 10^{-5}.N.

9. **Heat**

The **calorie** (small calorie, *or* **gram calorie**) is the amount of heat required to raise the temperature of 1 gram of water from 14·5°C. to 15·5°C. (This unit is deprecated.)

Thermodynamic temperature is traditionally expressed in °C., degrees Celsius (degrees Centigrade) denoted by t.

Degrees Kelvin (K) are reckoned from absolute zero so that

$t = T - 275{\cdot}15$ where T = absolute temperature.

The **large calorie** (kcal, *or* kilogram calorie, *or* **kilocalorie**) is the amount of heat required to raise the temperature of 1 kg of water from 14·5°C. to 15·5°C.

Heat equivalent of one litre of oxygen

5·14 Calories for glycogen	4·6 Calories for protein
4·4 Calories for oils	5·06 Calories for starch
4·6 Calories for fat	5·08 Calories for sucrose

22·4 litres of O_2 = 30 grams of glycogen

1 litre of O_2 = appox 5 Calories = approx. 15,000 foot-pounds
= 2134 kilogram metres

1 gram of O_2 = approx. 3·5 Calories.

At 0°C., 760 mm pressure, 1 litre CO_2
= 1·9652 grams; 1 litre O_2 = 1·4292 grams; 1 litre air
= 1·2928 grams; 1 litre water vapour = 0·8038 gram;
1 gram water vapour = 1·2440 litres

1 Calorie = 1 kilogram calorie (kcal) = 1000 gram calories
= 3·968 B.T.U. at 60°F. = 4185 joules
= 3086 foot-pounds = 426·7 kilogram metres
= 69·7 watt-minutes

1 watt-minute = 6·12 kilogram metres per second = 0·01435 Calorie

1 B.T.U. = 0·252 Calorie at 15°C. = 778 foot-pounds

10. **Miscellaneous**

$\pi = 3{\cdot}1415927$	cycles per second, CPS, *c/s*, Hz
$\simeq \frac{22}{7}$ $e = 2{\cdot}7183$	acceleration due to gravity = g

standard g = 980·7 cm per sec. per sec. (approx. 981 cm $sec.^{-2}$)
= 32·174 feet per sec. per sec. (approx. 32·2 ft. $sec.^{-2}$)

1 erg = $7{\cdot}371 \times 10^{-8}$ foot-pound (ft.-lb.)

1 dyne = $2{\cdot}247 \times 10^{-6}$ pound-weight (lb.-wt.)

1 kilogram-metre (kg-m) = 7·233 ft.-lb. = 0·002344 Calorie
= 0·009298 B.T.U.

1 ft.-lb. = 0·1383 kg-m = $1{\cdot}356 \times 10^7$ ergs = 1·356 J = 0·000324 Calorie

1 lb.-wt. = $4{\cdot}45 \times 10^5$ dynes

The SI unit of force is the **newton,** N. This kind of force produces an acceleration of 1 m per sec. per sec. acting on 1 kg.

1 N = 10^5 dynes 1 pound-force = 4·448 N 1 poundal = 0·138 N

1 kilogram-force = 9·806 N (deprecated)

One **erg** is the work done when a force of 1 dyne acts through 1 cm in the direction of force. 1 erg = 10^{-7} J.

The SI unit of work in the **joule** (J), the work done when a force of 1 N acts through 1 m in the direction of force.

1 J = 0·2423 Calorie = 10^7 ergs = 10,198 gram centimetres
= 0·00987 litre centimetre

1 kilogram force, 1 kilopound = weight of 1 kg at standard $g = 9{\cdot}806$ N

Power is the rate of doing **work.** The unit of power is **watt** (W) at the rate of about one-fourth Calorie per second = 0·01435 Calorie

1 watt = 1 joule/sec. 1 kilowatt hour = 3412 B.T.U.

1 watt-minute = 6·12 kg metres per second = 0·01435 Calorie

1 kg metre per sec. = 9·81 watts 1 watt hour = 0·85968 Calorie

1 horse-power (h.p.) = 33,000 ft-lb per min. = 746 W = 0·746 kilowatt
= 2·1 litres of O_2 per min. = 10·7 Calories per min.
= 642 Calories per hour

1 kcal = 427 kg m 1 mile per gallon = 2·83 litres per km

1 mile per hour = 88 ft per minute = 1·447 m per sec.
= 26·82 m per minute

Osmolarity is expressed in osmoles per litre of solution.

Osmolality is expressed in osmoles per kg of water

millisecond msec. (sometimes written σ)

1 sec. = 1000 msec. = 1000000 μ sec.

11. Table of normal values

BLOOD COUNT

Red cells: Males 4·5 to 6·5 (5) million per cu. mm
Females 3·9 to 5·6 (4·5) million per cu. mm

White cells: 4,000 to 11,000 per cu. mm

Neutrophils: 3,000 to 6,000 per cu. mm (60 to 70%)

Eosinophils: 150 to 400 per cu. mm (1·0 to 4·0%)

Basophils: 0 to 100 per cu. mm (0 to 1%)

Lymphocytes: 1500 to 2700 per cu. mm (25 to 30%)

Monocytes: 350 to 800 per cu. mm (5 to 10%)

Platelets: 250,000 to 450,000 per cu. mm

Reticulocytes: 0·5 to 1·5% of red blood cells

Haemoglobin (100% = 14·5 gm per 100 ml):
Males 14 to 17 gm per 100 ml (95 to 115%, Haldane)
Females 12 to 15·5 gm per 100 ml (82 to 105%, Haldane)

Packed cell volume (PCV) per cent.: Males 42 to 50 (45)
Females 38 to 45 (40)

Mean corpuscular volume (MCV) in cu. micron 78 to 94 (87)

Mean corpuscular haemoglobin (MCH) in pg 27 to 32 (29·5)

Mean corpuscular haemoglobin concentration (MCHC) per cent. 32 to 38 (35)

Mean corpuscular diameter (MCD) in micron 6·7 to 7·7 (7·2)

Osmotic fragility of red cells: Haemolysis begins at 0·48 per cent. saline and is complete at 0·33 per cent. saline.

Bleeding time: 2 to 5, sometimes up to 7, (3·25) minutes.

Coagulation time (normal): 6 to 17 minutes in glass-tube
19 to 60 minutes in siliconsied tube (Lee and White)
5 to 11 minutes (Dale and Laidlaw)

Prothrombin time: 11 to 16 seconds

ESR: (Westergen) Men 3 to 5 mm in 1 hour
" Women 4 to 7 mm in 1 hour
(Wintrobe) Men 0 to 6·5 (3·7) mm in 1 hour
" Women 0 to 15 (3·7) mm in 1 hour

Total blood volume (normal): 78 to 97 ml per kg body weight

NORMAL VALUES IN HUMAN WHOLE BLOOD*

Aceto-acetate + acetone	0·3 to 2·0 mg *per* 100 ml
Aldosterone	3·0 to 10 mμg *per* 100 ml
α-amino acid nitrogen	3·0 to 5·4 mg *per* 100 ml
Amylase	4·0 to 25·0 units *per* ml
Ascorbic acid	0·4 to 1·5 mg *per* 100 ml *in fasting period*
Bilirubin	0·1 to 0·3 mg *per* 100 ml (*directly*)
	0·2 to 1·3 mg *per* 100 ml (*indirectly*)
Calcium	4·2 to 5·2 mEq *per* litre;
	8·5 to 10·5 mg *per* 100 ml
CO_2 content	25 to 30 mEq *per* litre
Carotenoid	8 to 40 μg *per* 100 ml
Ceruloplasmin	26 to 38 mg *per* 100 ml
Chloride	340 to 380 mg *per* 100 ml
Cholesterol	150 to 280 mg *per* 100 ml
Cholesterol ester	60 to 75 per cent. of cholesterol (*total*)
Copper (*total*)	1·0 to 2·0 μg *per* ml
Cortisol (17–hydroxycorticoids)	0·05 to 0·2 μg per ml
Creatinine	0·6 to 1·5 mg *per* 100 ml
Glucose (*Folin*)	0·8 to 1·2 mg *per* ml *in fasting period*
Glucose (*true*)	0·7 to 1·0 mg *per* ml
PBI	3·4 to 8·0 μg *per* 100 ml
Iron	0·5 to 1·5 μg *per* ml
Lactic acid	0·6 to 1·8 mEq *per* litre
Lipase	less than 2 units *per* ml
Lipoid (*total*)	4·5 to 10·0 mg *per* ml
Mg	1·0 to 2·0 mg *per* 100 ml;
	1·5 to 2·5 mEq *per* litre
NPN	0·15 to 0·35 mg *per* ml
Osmolality	285 to 295 mOsm *per* litre
pCO_2 (*arterial*)	35 to 45 mm of Hg
Pepsinogen	200 to 430 units *per* ml
pH	7·36 to 7·45
Phenylalanine	0·0 to 2·0 mg *per* 100 ml
phospholipid	1·5 to 2·3 mg *per* ml
Phosphorus (*inorganic*)	3·0 to 4·5 mg *per* 100 ml (up to 6·0 mg *per* 100 ml—*infants in first year*)
pO_2 (*arterial*)	75 to 100 mm of Hg
Protein (*total*)	6·0 to 8·0 g *per* 100 ml
Albumin	4·0 to 5·0 g *per* 100 ml
Globulin	2·0 to 3·0 g *per* 100 ml
Pyruvic acid	0·0 to 0·12 mEq per litre
Sodium	3·0 to 3·5 mg *per* ml;
	135 to 145 mEq *per* litre
Sulphate	0·5 to 1·5 mEq *per* litre
Transaminase	10 to 40 units per ml
Urea nitrogen	8 to 24 mg *per* 100 ml
Uric acid	3·0 to 7·0 mg *per* 100 ml
Vitamin A	15 to 60 μg *per* 100 ml

*Modified after Ganong's.

DAILY DIETARY ALLOWANCES*

Age (yr)	Wt (kg)	Ht (cm)	Cal	Protein (g)	Fat-soluble vitamins		Water-soluble vitamins							Minerals				
					A activity (I.U.)	E activity (I.U.)	Ascorbic acid (mg)	Folic acid (mg)	Niacin equiv. (mg)	Riboflavin (mg)	Thiamine (mg)	B_6 (mg)	B_{12} (μg)	Ca (g)	Phos (g)	I (μg)	Fe (mg)	Mg (mg)
Infants																		
0–1/6	4	55	kg × 120	kg × 2·2	1500	5	35	0·05	5	0·4	0·2	0·2	1·0	0·4	0·2	25	6	40
1/6–1/2	7	63	kg × 110	kg × 2·0	1500	5	35	0·05	7	0·5	0·4	0·3	1·5	0·5	0·4	40	10	60
1/2–1	9	72	kg × 100	kg × 1·8	1500	5	35	0·1	8	0·6	0·5	0·4	2·0	0·6	0·5	45	15	70
Children																		
1–2	12	81	1100	25	2000	10	40	0·1	8	0·6	0·6	0·5	2·0	0·7	0·7	55	15	100
2–3	14	91	1250	25	2000	10	40	0·2	8	0·7	0·6	0·6	2·5	0·8	0·8	60	15	150
3–4	16	100	1400	30	2500	10	40	0·2	9	0·8	0·7	0·7	3	0·8	0·8	70	10	200
4–6	19	110	1600	30	2500	10	40	0·2	11	0·9	0·8	0·9	4	0·8	0·8	80	10	200
6–8	23	121	2000	35	3500	15	40	0·2	13	1·1	1·0	1·0	4	0·9	0·9	100	10	250
8–10	28	131	2200	40	3500	15	40	0·3	15	1·2	1·1	1·2	5	1·0	1·0	110	10	250

*Adapted from the Food and Nutrition Board, National Academy of Science, National Research Council (1968), U.S.A.

DAILY DIETARY ALLOWANCES*

Age (yr)	Wt (kg)	Ht (cm)	Cal	Protein (g)	Fat-soluble vitamins		Water-soluble vitamins							Minerals				
					A activity (I.U.).	E activity (I.U.)	Ascorbic acid (mg)	Folic acid (mg)	Niacin equiv. (mg)	Riboflavin (mg)	Thiamine (mg)	B_6 (mg)	B_{12} (μg)	Ca (g)	Phos (g)	I (μg)	Fe (mg)	Mg (mg)
Males																		
10–12	35	140	2500	45	4500	20	40	0·4	17	1·3	1·3	1·4	5	1·2	1·2	125	10	300
12–14	43	151	2700	50	5000	20	45	0·4	18	1·4	1·4	1·6	5	1·4	1·4	135	18	350
14–18	59	170	3000	60	5000	25	55	0·4	20	1·5	1·5	1·8	5	1·4	1·4	150	18	400
18–22	67	175	2800	60	5000	30	60	0·4	18	1·6	1·4	2·0	5	0·8	0·8	140	10	400
22–35	70	175	2800	65	5000	30	60	0·4	18	1·7	1·4	2·0	5	0·8	0·8	140	10	350
35–55	70	173	2600	65	5000	30	60	0·4	17	1·7	1·3	2·0	5	0·8	0·8	125	10	350
55–75+	70	171	2400	65	5000	30	60	0·4	14	1·7	1·2	2·0	6	0·8	0·8	110	10	350
Females																		
10–12	35	142	2250	50	4500	20	40	0·4	15	1·3	1·1	1·4	5	1·2	1·2	110	18	300
12–14	44	154	2300	50	5000	20	45	0·4	15	1·4	1·2	1·6	5	1·3	1·3	115	18	350
14–16	52	157	2400	55	5000	25	50	0·4	16	1·4	1·2	1·8	5	1·3	1·3	120	18	350
16–18	54	160	2300	55	5000	25	50	0·4	15	1·5	1·2	2·0	5	1·3	1·3	115	18	350
18–22	58	163	2000	55	5000	25	55	0·4	13	1·5	1·0	2·0	5	0·8	0·8	100	18	300
22–35	58	163	2000	55	5000	25	55	0·4	13	1·5	1·0	2·0	5	0·8	0·8	100	18	300
35–55	58	160	1850	55	5000	25	55	0·4	12	1·5	0·9	2·0	5	0·8	0·8	90	18	300
55–75+	58	157	1700	55	5000	25	55	0·4	10	1·5	0·9	2·0	6	0·8	0·8	80	10	300
Pregnancy	..	..	+200	65	6000	30	60	0·8	15	1·8	+0·1	2·5	8	+0·4	+0·4	125	18	450
Lactation	..	..	+1000	75	8000	30	60	0·5	20	2·0	+0·5	2·5	6	+0·5	+0·5	150	18	450

*Adapted from the Food and Nutrition Board, National Academy of Science, National Research Council (1968), U.S.A.