SOLUTIONS

Mentors Eduserv

All India Test Series 2018

Unit Test-4

NEET PATTERN

Test Date: 23-09-2017

Mentors Eduserv: Plot No.-136/137, Parus Lok Complex, Boring Road Crossing,
Patna-1, Ph. No. : 0612-3223680 / 81, 7781005550 / 51

PHYSICS

1. **(3)**

For point A and C, loop BCD shorted

Hence, $R_{AC} = \frac{r \times 2r}{3r} = \frac{2}{3}r$

2. **(3)**

$H \propto \frac{1}{R}$

R becomes half, so heat generate will be doubled.

3. **(1)**

4. **(3)**

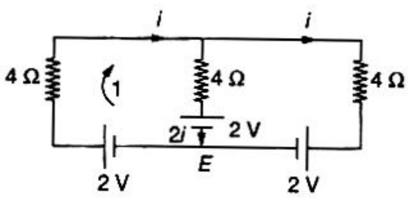
As $V = E - I.r$ and $I = \frac{E}{R+r} \Rightarrow r = \frac{(E-V)R}{V}$

5. **(2)**

6. **(4)**

By KVL in loop 1 2 – 4i – 8i – 2 = 0

$\Rightarrow i = 0$



7. **(3)**

EMF = (4 – 1) E = 3 E. Internal resistance = 5r

8. **(4)**

$i_g(G+R) = V,\ 10^{-3}(400+R) = 8, R = 7600\ \Omega$

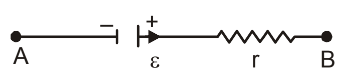
9. **(2)**

10. **(1)**

Current in circuit $i = \frac{n\varepsilon}{nr} = \frac{\varepsilon}{r}$

The equivalent circuit of one cell is shown in figure potential difference across the cell $= V_A - V_B = -\varepsilon + ir$

$= -\varepsilon + \frac{\varepsilon}{r}.r = 0$



11. (1)

As $P \neq R$ and reading of galvanometer is same, wheatbridge must be balanced and in that case, $I_R = I_G$

12. (2)

$$H = \int_0^{a/b} I^2 R dt \Rightarrow H = \int_0^{a/b} (a - 2bt)^2 R dt = \frac{a^3 R}{3b}$$

13. (1)

14. (2)

15. (4)

$$H = i^2 RT = i^2 \left(\frac{\rho l}{A}\right) t = \frac{i^2 \rho V t}{A^2} (V = \text{volume})$$

$$\Rightarrow H \propto \frac{1}{r^4}$$

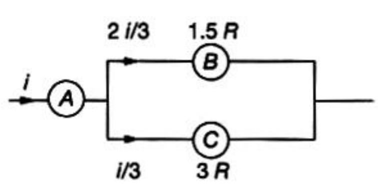
$$\Rightarrow \frac{H_1}{H_2} = \left(\frac{r_2}{r_1}\right)^4 = \left(\frac{2}{1}\right)^4 = \frac{16}{1}$$

16. (1)

$V_A = iR$

$$V_B = \left(\frac{2i}{3}\right) 1.5R = iR$$

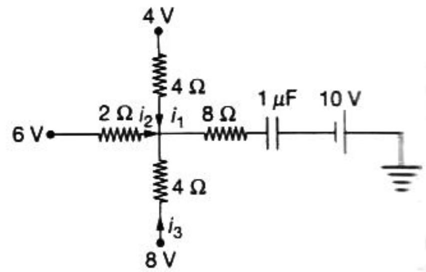
$$V_C = \left(\frac{i}{3}\right)(3R) = iR$$



17. (4)

Let the potential of the junction be V. Then

$$\frac{6 - V}{2} + \frac{4 - V}{4} + \frac{8 - V}{4} = 0$$



$12-2V+4-V+8-V=0$

$$24 = 4V$$

$$V = 6\text{ V}$$

18. **(4)**

Let R_0 be the resistance of both conductors at 0ºC.

Let R_1 and R_2 be their resistane at tºC, then

$R_1 = R_0(1+\alpha_1 t)$

$R_2 = R_0(1+\alpha_2 t)$

Let R_s be the resistance of the series combiantion of two conductors at tºC, then

$R_s = R_1 + R_2$

$R_{s0}(1+\alpha_s t) = R_0(1+\alpha_1 t) + R_0(1+\alpha_2 t)$

where $R_{s0} = R_0 + R_0 = 2R_0$

$\therefore 2R_0(1+\alpha_s t) = 2R_0 + R_0 t(\alpha_1+\alpha_2)$

$2R_0 + 2R_0\alpha_s t = 2R_0 + R_0 t(\alpha_1+\alpha_2)$

$\therefore \alpha_s = \dfrac{\alpha_1+\alpha_2}{2}$

Let R_p be the resistance of the parallel combination of two conductors at tºC. Then

19. **(3)**

Resistance of the bulb

$(R) = \dfrac{V^2}{P} = \dfrac{(220)^2}{100} = 484\Omega$

Power across $110V = \dfrac{(110)^2}{484}$

$\therefore$ Power $= \frac{110 \times 110}{484} = 25\,W$

20. (2)

T = 300 K to 400 K

For Cu, R = R_0 $(1+\alpha t)$ therefore linear

For Si, exponential decrease

21. (3)

$I = neAv_d$

$R = \frac{V}{neAv_d}$

$\rho = \frac{V}{nev_d.\ell}$

$\rho = \frac{5}{8 \times 10^{28} \times 1.6 \times 10^{-19} \times 2.5 \times 10^{-4} \times (0.1)}$

$\rho = 1.6 \times 10^{-15}\,\Omega m$

22. (3)

$R_1 = \frac{(220)^2}{25}\; R_2 = \frac{(220)^2}{100}$

$i = \frac{440}{(220)^2\left(\frac{1}{25} + \frac{1}{100}\right)} = \frac{2}{220} . \frac{100}{5} = \frac{2}{11} A$

$\therefore\; P_1 = \left(\frac{2}{11}\right)^2 . \frac{(220)^2}{25} = 64W > 25\,W$

$P_2 = \left(\frac{2}{11}\right)^2 . \frac{(220)^2}{100} = 16\,W$

$\therefore$ bulb of 25 W - 220V will fuse.

23. (2)

The equivalent circuit is a balanced wheatstone bridge.

Hence, no current flows through arm BD.

AB and BC are in series

$\therefore\ R_{ABC} = 5 + 10 = 15\ \Omega$

AD and DC are in series

$\therefore R_{ADC} = 10 + 20 = 30\ \Omega$

ABC and ADC are in parallel

or $R_{eq} = \dfrac{15 \times 30}{15 + 30} = 10\ \Omega$

$\therefore$ current $I = \dfrac{5}{10} = 0.5A$

24. (3)

If internal resistance is zero, the energy sources will supply a constant current.

25. (2)

$\text{Power} = \dfrac{V^2}{R}$

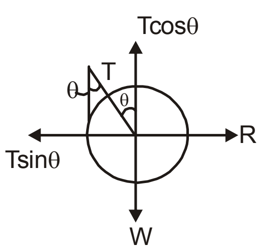
$\therefore\ 150 = \dfrac{(15)^2}{R} + \dfrac{(15)^2}{2} = \dfrac{225}{R} + \dfrac{225}{2} 6\ \Omega$

26. (1)

$a = \left(\dfrac{M - m}{M + m}\right)g,\ s = \dfrac{1}{2}at^2$

$\Rightarrow 1.4 = \dfrac{1}{2}\left(\dfrac{M - m}{M + m}\right)g(2)^2 \Rightarrow \dfrac{m}{M} = \dfrac{13}{15}$

27. (3)



$T \sin\theta = R$

$T \cos\theta = W$

Solving,

$T^2 = R^2 + W^2$

R = W tan θ

Vertically

$$\vec{R}+\vec{T}+\vec{W}=0$$

28. (1)

$N_A = N_B$

29. (2)

$$T_1=\frac{mg}{\cos\theta}, T_2=mg\cos\theta$$

$$\frac{T_1}{T_2}=\sec^2\theta=2$$

30. (2)

$$19.6=\mu\times10\times9.8$$

$$\mu=0.2$$

31. (4)

Surface between wall and A is smooth, so the system will fall with acceleration g.

32. (1)

$$v^2=2g\sin\theta\frac{l}{2}$$

Also, $v^2=-(g\sin\phi-\mu g\cos\phi)\dfrac{l}{2}$

$$\Rightarrow\ -g\sin\phi+\mu g\cos\phi=g\sin\phi$$

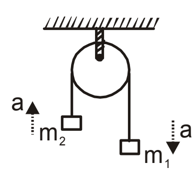
$$\Rightarrow\ \tan\phi-\frac{\mu}{2}$$

$$\Rightarrow\ \mu=2\tan\phi$$

33. (2)

By pulling force method,

$$a=\frac{(m_1-m_2)g}{(m_1+m_2)}=\frac{g}{8};\text{(given)}$$



$$\Rightarrow\ \frac{m_1-m_2}{m_1+m_2}=\frac{1}{8}\Rightarrow\frac{m_1}{m_2}=\frac{9}{7}$$

34. (3)

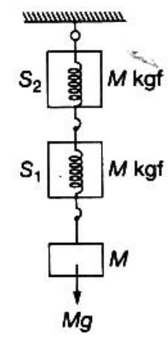
For the man standing in the lift,

$\vec{a}_{bm} = \vec{a}_b - \vec{a}_m \Rightarrow \vec{a}_{bm} = (g - a)$

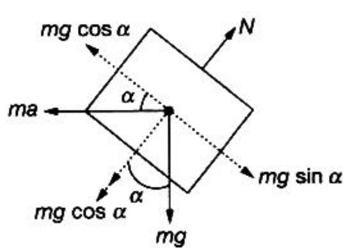
$\vec{a}_{bm} = \vec{a}_b - \vec{a}_m \Rightarrow a_{bm} = g - 0 \Rightarrow a_{bm} = g$

35. (1)

Earth pulls the block by a force Mg. The block is turn exerts a force Mg on the spring of spring balance S_1, which therefore shows a reading of M kgf. The spring S_1 is massless and hence it exerts a force of Mg on the spring of spring balance S_2 which leads to the reading of M kgf of spring balance S_2



36. (4)



Analysing from inclined surface frame, FBD of block

For block to remain stationary,

$mg\sin\alpha = ma\cos\alpha$

$\therefore a = g\tan\alpha$

37. (3)

For equilibrium of $\sqrt{2}M$ block

$2T\cos\theta = \sqrt{2}\ mg,\ T = Mg,\ \cos\theta = \frac{1}{\sqrt{2}}, \theta = 45^\circ$

38. (3)

T – mg = ma

T = mg + ma

Kx = m(g + a)

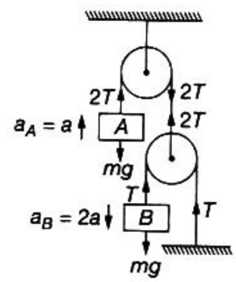
$$x = \frac{m(g+a)}{K}$$

39. (4)

2T – mg = ma .....(1)

mg – T = 2 ma .....(2)

(1) and (2) $\Rightarrow a = \frac{g}{5}$



$$\therefore\ a_B = \frac{2g}{5}$$

40. (4)

$$a = \frac{F_1 - F_2}{m_1 + m_2 + m_3} = 10ms^{-2}$$

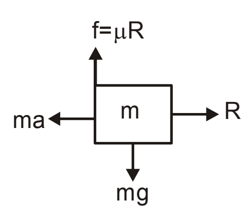
$$R - F_2 = m_3 a$$

R = 30 N

41. (3)

$$\Sigma F_y = 0, R = ma$$

$$Mg = \mu R = \mu ma$$



$$\mu = \frac{g}{a} = 0.5$$

42. (3)

Retarding force F = – 50N

Mass of the body m = 20 kg

Initial speed u = 15 m/s

Final speed v = 0

time t = ?

Force F = ma

or $a = \frac{F}{m} = -\frac{50}{20} = -2.5\ m/s^2$

Using equation of motion v = u + at

$\therefore 0 = 15 + (-2.5)t$

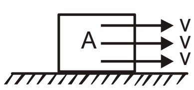
or $t = \frac{15}{2.5} = 6s$

43. (1)

44. (3)

In a uniform translatory motion, all parts of the ball have the same velocity in magnitude and direction and this velocity is constant.

The situation is shown in adjacent diagram where a body A is in uniform translatory motion



45. (1)

During upward motion,

Net force acting on pebble (F) = ma

= 0.05 × 10N

= 0.5 N (Vertically downward)

During downward motion,

Net force acting on pebble (F) = ma

= 0.05 × 10 N

= 0.5 N (Vertically downward)

At the highest point,

Net force acting on pebble (F) = ma

= 0.05 × 10N

= 0.5 N (Vertically downward)

CHEMISTRY

46. (4)

It is definition of isomers

47. (1)

It is definition of structural isomers

48. (1)

It is definition of chain isomers

49. (2)

Application of concept of question no 48.

50. (4)

Factual question

51. (4)

Definition of positional isomers

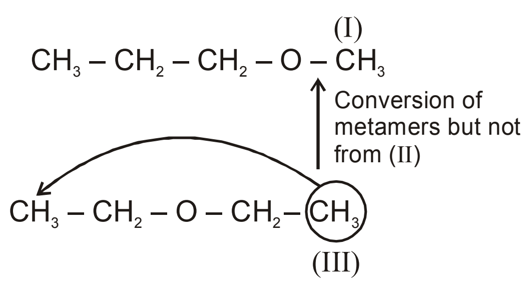
52. (4)

Factual question

53. (4)

No of $\pi +$ ring is known as unsaturation factor

54. (2)



55. (4)

Ring chain isomer are compound of open chain & cyclic structure.

56. (4)

In question does not have hyper conjugable $\alpha - H$ (infact, Bridge-headed $\alpha - H$ does not participate in tautormerism.

57. (4)

58. (1)

Enolic cantent $\propto$ stability of enol

end of X% is aromatic

end of Z% is anti aromatic end of Y% is non-aromatic

$\therefore$ enolic content x > y > z

59. (1)

In basic medium less stable enol (having less $\alpha - H$) is formed

60. (2)

In acidic medium more stable enol (having more $\alpha - H$) is formed

61. (3)

Molecular weight of a sample of air

$$= \frac{28 \times 4 + 32 \times 1}{5} = 28.8$$

$\therefore$ Vapour density $= \frac{28.8}{2} = 14.4$

62. (2)

T = 127+273=400 K

When T is doubled in absoulute scale, volume will be doubled as 30800K or 527°C.

63. (1)

P_1 = 1 atm; p_2=1.004 ($\therefore$ The increase in pressure is 0.4% per 1°C).

$T_1 = x°C;\ T_2 = (x+1)°C$

$$\frac{P_1}{T_1} = \frac{P_2}{T_2} \text{ or } \frac{1}{x} = \frac{1.004}{x+1}$$

x+1=1.004x or 0.004x=1

$$x = \frac{1}{0.004} = 250K$$

64. (1)

At STP, i.e., 0°C and 1 mole of He occupies 22.4 litres.Since the temperature is more than 0°C (30°C), 22.4 litre of He contain less than 1 mole. So, 0.9 mole.

65. (3)

Volume of gas will be maximum at high temperature and low pressure. So, molar volume of CO_2 is maximum at 127°C and 1 atm.

66. (2)

4.4 g of CO_2 contain 6.023×10^{22} molecules

2.24 litre of H_2 contain 6.023×10^{22} molecules

$\therefore$ Totally, there are 1.2046×10^{23} molecules.

67. (3)

If the weight of 5.6 litre of HF at NTP is 10g tghe MW of HF will be.

$$\frac{22.4\times10}{5.6}=40$$

Empirical formula wt. of HF = 20

$$\therefore \quad \frac{40}{20}=2$$

Hence, molecular formula of HF is H_2F_2.

68. (3)

$$\frac{V_1}{T_1}=\frac{V_2}{T_2}\Rightarrow\frac{20}{100}=\frac{V_2}{300} \text{ or } \frac{20}{100}\times300=60 \text{ litre}$$

Change in volume is 60 – 20 = 40 litres.

69. (3)

70. (4)

$$\frac{W_1}{W_2}=\sqrt{\frac{M_1}{M_2}};\frac{2}{W_2}=\sqrt{\frac{2}{32}}$$

$$\frac{2}{W_2}=\frac{1}{4} \text{ or } W_2=8g$$

71. (3)

$$\frac{r_1}{r_2}=\sqrt{\frac{Vd_2}{Vd_1}}\ r_1=\frac{V_1}{t_1}, r_2=\frac{V_2}{t_2} \text{ and } V_{d_1}=11$$

$$\frac{20}{5}\times\frac{10}{V_2}=\sqrt{\frac{22}{11}} \text{ or } \nu_2=\frac{20\times10}{5\times\sqrt{2}} \text{ or } 20\sqrt{2}$$

72. (3)

Partial pressure of argon = Total pressure × mole fraction of argon

$\therefore$ The partial pressure of argon $=\frac{2}{5}$ of the total pressure.

73. (2)

When the same container is divided into compartments the pressure in all compartments will be equal though their sizes are different because $\nu \propto n$.

74. (3)

$$KE = \frac{3}{2}nRT$$

Since KE for both He and Ar are equal.

$$\frac{3}{2}n_1RT_1 = \frac{3}{2}n_2RT_2$$

$$T_1 = \frac{0.4 \times 400}{0.3} = 533\ K$$

75. (1)

$$KE = \frac{3}{2}nRT$$

$$= \frac{3}{2} \times \frac{8}{16} \times 8.314 \times 300 = 1870.6\ J$$

76. (3)

Hoope's process $\rightarrow$ Purification of Al

Le-Blanc process $\rightarrow$ Manufacture of Na_2CO_3

Lane's process $\rightarrow$ Manufacture of H_2 (by passing steam over spongly iron at 773–1050K)

$$3Fe + 4H_2O \rightarrow Fe_3O_4 + 4H_2$$

Carter's process $\rightarrow$ manufacture of basic lead carbonate.

77. (2)

Protium (P), deuterium (D) and tritium (T) are the three isotopes of hydrogen. These isotopes follow the order in different contexts as shown below

$T_2 > D_2 > P_2$ [order of boiling point (BP)]

$T_2 > D_2 > P_2$ [order of bond energy (BE)]

$T_2 = D_2 = P_2$ [order of bond length (BL)]

$T_2 < D_2 < P_2$ [order of reactivity with Cl_2)]

78. (2)

79. (2)

TEL (tetraatby lead) is used as antiknock agent in petrol engine. D_2O is used as moderator in nuclear reactor. H_2D_2 is used for bleaching delicate articles like Wood chair. It is also used as an antiseptic and germicide.

R–O–R (ether) is used as a solvent.

80. (4)

$$\underset{\text{Zeolite}}{Na_2 + Z} + M^{2+} \rightarrow 2Na^+ + MZ (M = Ca\ or\ Mg)$$

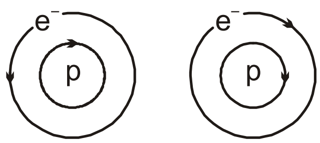
81. (3)

Alkalie earth metal salts cause hardnes. Temporary hardness is caused by solute Ca and Mg hydrogen carbonates. Calcium and magnesium sulphates and chlorides cause permanent hardness.

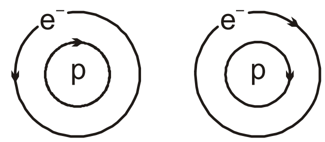
82. (3)

Degree of hardness of water is measured in terms of ppm by weight of $CaCO_3$ irrespective of whether it is actually present or not.

83. (3)



ortho hydrogen
[Parallel nuclear spins:
$= +\frac{1}{2} + \left(+\frac{1}{2}\right) = 1$]



Para hydrogen
[Anti-parallel nuclear spins:
total nuclear spin
$= +\frac{1}{2} + \left(-\frac{1}{2}\right) = 0$]

84. (3)

Semi-water gas is, in fact, a mixture of water gas ($CO+H_2$) and producer gas ($CO+N_2$). Its approximate composition is CO = 25.28%; N_2 = 50.55%; H_2 = 10 - 12%; CO_2 = 4.5%.

85. (3)

H_2O_2 can be prepared by electrolysis of 50% H_2SO_4. In this method, hydrogen is liberated at cathode.

$$H_2O_4 2H^+ + 2HSO_4^-$$

At anode $2HSO_4^- \rightarrow H_2SO_4 + 2e^-$

$$H_2S_2O_8 + 2H_2O \rightarrow 2H_2S_2O_8 + H_2O_2$$

At cathode $2H^+ + 2e^- \rightarrow H_2 \uparrow$

86. (3)

In laboratory, H_2O_2 is prepared by Merck's process shown as bvelow :

$$\underset{\text{Sodium peroxide}}{Na_2O_2} + H_2SO_4 \rightarrow Na_2SO_4 + \underset{\text{Hydrogen peroxide}}{H_2O_2}$$

87. (1)

Due to electron donating property of H_2O_2, it acts as a reducing agent in acidic as well sis in alkaline medium and gets oxidised to O_2.

$$HOCl + H_2O_2 \xrightarrow{H^+} H_3O^+ + Cl^- + O_2$$

On the other hand, its reaction with Mn^{2+}, Fe^{2+} and PbS, show its oxidising property in which it reduces to H_2O.

88. (1)

'10V H_2O_2' means 1L of this solution will produce 10L O_2 at STP.

$$\underset{68g}{2H_2O_2} \rightarrow 2H_2O + \underset{22.4L\ at\ STP}{O_2}$$

$\because$ 22.4 L of O_2 is obtained from H_2O_2=68g

$\therefore$ 10 L of O_2 will be obtained from

$$H_2O_2 = \frac{68}{22.4} \times 10 = 30.36g\ H_2O_2.$$

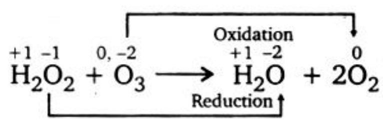
100 mL of the given solution conains 30.36g

H_2O_2 and 100 mL of the given solution contains

$$\frac{30.36 \times 100}{1000} = 3.039\ H_2O_2$$

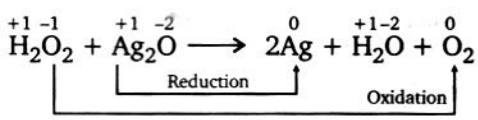
89. (1)

In the reaction



Since H_2O_2 oxidises O_3 into O_2, thus it behaves as an oxidising agent.

Further in the reaction,



Here H_2O_2 reduces Ag_2O intometallic (Ag) (as oxidstion number is reducing from +1 to 0). Thus, H_2O_2 behaves as a reducing agent.

90. (1)

BOTANY

91. (1)

92. (4)

Species → Genus → family → order → class → division → kingdom

93. (1)

94. (3)

95. (3)

96. (2)

97. (3)

98. (4)

99. (4)

100. (4)

BGA lacking membrane bound organelles because it is a prokaryote

101. (4)

102. (1)

103. (4)

104. (3)

Plant viruses are usually ribovira (RNA containing)

105. (4)

106. (1)

107. (4)

108. (3)

Mycorrhiza is formed due to association between roots and fungi, as found in Pinus.

109. (1)

Mucor, Albugo & Rhizopus blong to Phycomycetes.

110. (4)

111. (1)

Unlike viruses, Viroids do not have protein capsids protecting their nucelic acid.

112. (4)

113. (3)

114. (1)

115. (3)

116. (4)

117. (4)

118. (4)

119. (1)

120. (3)

121. (2)

Angiospermic embryosac is usually 7 celled and 8 nucleated structure.

122. (1)

123. (2)

124. (4)

Diatom cells are contained within a unique silica call wall known as a frustule

125. (2)

126. (4)

Bryophytes are avascularized.

127. (3)

Peristome teeth help in spore dispersal in Funaria.

128. (4)

Leaves of both Cycas & Pinus possess Transfusion tissue.

129. (3) **130. (3)**

131. (4)

132. (4)

133. (2)

Laminaria & fucus belong to Phaeophyceae.

134. (4)

Gymnosperms lack fruit, so seeds remain unprotected.

135. (1)

ZOOLOGY

136. (3)

Renal cortex is projected towards the medulla between the medullary pyramids as columns of Bertin.

137. (1)

Juxtamedullary nephrons are only 15% of total nephrons and they have U-shaped vasa rectae around their long loop of Henle.

138. (4)

Glomerular capillaries have simple squamous endothelial cells on them while the visceral layer of Bowman's capsule contains cells having foot like projections (pedicels) on them. These cell make filtration/slit pores for filtration.

139. (2)

The cells in afferent arteriole are called juxtaglomerular cells while in distal convoluted tubule, cells are called macula densa cells.

140. (4)

Selective secretion of H^+, K^+ and NH_3 and absorption of HCO_3^- occurs in PCT.

141. (4)

Formation of urea is a transamination deamination type of reaction.

142. (2)

Reabsorption in loop of Henle is minimum though this region plays a significant role in maintenance of high osmolarity of medullary interstitial fluid.

143. (4)

A fall in glomerular blood flow triggers the renin angiotensin aldosterone system (RAAS). ANF from right atrium of the heart inhibits RAAS.

144. (2)

145. (2)

Diabetes mellitus is the loss of glucose through urine, causing utilization of fatty acids for normal body activities and hence producing ketone bodies which are excreted through urine.

146. (2)

The porous cellophane membrane allows passage of molecules based on concentration gradient.

147. (2)

Urea from medullary interstitium enters ascending limb of loop of Henle, returning back to collecting duct.

148. (1)

Kidneys are located in the abdominal cavity between the levels of last thoracic and third lumbar vertebra close to dorsal inner wall of abdominal cavity and their inner concave surface has hilum in centre.

149. (2)

All the nephrons have their malphigian corpuscles lying in the cortical region only. Juxta medullary nephrons have a loop of Henle extending into medulla.

150. (3)

Excess monovalent ions taken in through sea water are eliminated by ionocytes while excess divalent ions are removed along with faecal matter.

151. (2)

Liver converts the break down products of haemoglobin into bile pigments - billirubin and billiverdin.

152. (1)

Tubular maxima is the maximum concentration of a substance upto which it will be reabsorbed completely. Beyond this concentration, it starts appearing in urine.

153. (1)

Ductus arteriosus found in foetal life.

154. (2)

155. (4)

156. (4)

157. (4)

Capillary has only one lining Tunica interna.

158. (2)

159. (3)

160. (3)

161. (3)

162. (1) 163. (1) 164. (2) 165. (3) 166. (1)

167. (3)

168. (3)

169. (2) 170. (2) 171. (2) 172. (3) 173. (2)

174. (2)

175. (4)

176. (1)

177. (4)

178. (1) 179. (1) 180. (4)