PACE-IIT & MEDICAL

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Online TWT -(NEET 2018 Aspirants) - Solutions

1.
2.
3.
4.

5.

(d) $\frac{F_2}{F_1} = \frac{mg_2}{mg_1} = \frac{(R^2)}{(R+h)^2} = \left(\frac{6400}{8000}\right)^2 = \frac{16}{25}$

6.

(c) $F = \frac{GMm}{r^2} = \frac{GM^2}{4R^2} = \frac{G[\rho \times (4/3)\pi R^3]^2}{4R^2}$

i.e. $F \propto R^4$

7.

8.

(b) At a point where gravitational intensity is zero.

$E_1 = E_2 \therefore \frac{G \times 81M}{x^2} = \frac{GM}{(D-x)^2}$ i.e. $\frac{9}{x} = \frac{1}{D-x}$

$9D - 9x = x$ i.e. $x = \frac{9D}{10}$

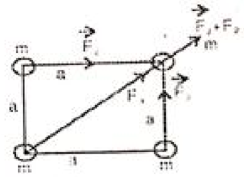
9.

10.

(c) $\left(\text{Hint}: \frac{M_1M_2}{r^2}\right)$

11.

(d)



$\vec{F} = \vec{F_1} + \vec{F_2} + \vec{F_3}$

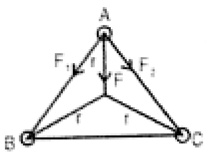
$\vec{F_1} + \vec{F_2} = \sqrt{\left(\frac{Gm}{a^2}\right)^2 + \left(\frac{Gm}{a^2}\right)^2} \quad = \frac{Gm}{a^2}\sqrt{2}$

$\vec{F_3} = \frac{Gm}{2a^2}$

$\vec{F_1} + \vec{F_2} + \vec{F_3} = \frac{Gm}{a^2}\sqrt{2} + \frac{Gm}{2a^2} \quad = \frac{Gm}{a^2}\left(\sqrt{2} + \frac{1}{2}\right)$

12.

(b)



Length of each side of triangle = a
Force acting on particle at A due to particle at B

: $F_1 = \frac{Gm^2}{a^2}$ $\quad$ F_1 is along AB

$F_2 = \frac{Gm^2}{a^2}$ F_2 is along AC

Resultant of F_1 and F_2 is F :

$F = \sqrt{F_1^2 + F_2^2 + 2F_1F_2\cos\theta}$

$F = \sqrt{\left(\frac{Gm^2}{a^2}\right)^2 + \left(\frac{Gm^2}{a^2}\right)^2 + 2\left(\frac{Gm^2}{a^2}\right)^2 \cos 60}$

$F = \sqrt{2\left(\frac{Gm^2}{a^2}\right)^2 + 2\left(\frac{Gm^2}{a^2}\right)^2 \times \frac{1}{2}}$

$F = \sqrt{3\left(\frac{Gm^2}{a^2}\right)^2} \quad = \sqrt{3}\left(\frac{Gm^2}{a^2}\right)$

To revolve particle at A in circular path this force F should provide required centripetal force.

$\therefore \sqrt{3}\left(\frac{Gm^2}{a^2}\right) = \frac{mv^2}{r^2}$

Where r is radius of circle.

13.

14.

15.

16.

17.

18. (d) Change in P.E. to raise height of R/4 is

P.E. $=\frac{mgR}{5}$; To throw a body to height R/4

KE=P.E; $\frac{1}{2}mv^2=\frac{mgR}{5}\therefore v=\sqrt{\frac{2}{5}gR}$

19. (3) $T^2 \propto r^3$

20.

(a) $T = 2\pi\sqrt{\frac{R^3}{G\times d\times\frac{4}{3}\pi R^3}} = \left(\frac{3\pi}{dG}\right)^{1/2}$

21. (3) Apparent weight mg-mR$\omega^2 = 0$

$\omega^2 = g/R \therefore \frac{4\pi^2}{T^2} = g/R$

$T^2 = \frac{4\pi^2 R}{g} = \frac{4\times 9.87\times 6400\times 10^3}{9.8} \approx 84.58\,\text{min}$

22.

(b) Speed of satellite in circular orbit, $\upsilon = \sqrt{\frac{GM}{r}}$

As G and M are constant

$\frac{d\upsilon}{\upsilon} = -\frac{1}{2}\frac{dr}{r} \quad = -\frac{1}{2}\left(\frac{-1}{100}\right) \quad = \frac{0.5}{100}$

23.

(d) $r_1 = R$ and $r_2 = 1.02\,R$

$\therefore \frac{r_2}{r_1} = \frac{1.02}{1} = \frac{102}{100} \quad \therefore \frac{dr}{r} = \frac{2}{100}$

$\frac{dr}{r_1} = \frac{2}{100}$ and $T = 2\pi\sqrt{\frac{r^3}{GM}}$

$\therefore \frac{dT}{T} = \frac{3}{2}\frac{dr}{r} = \frac{3}{2}\times\frac{2}{100} = \frac{3}{100} = 3\%$

24.

25.

26.

(b) Centripetal force = Gravitational force

$$mR\omega^2 = \frac{GMm}{R^{5/2}} \quad \therefore \ \omega^2 = \frac{GM}{R^{7/2}}$$

$$\frac{4\pi^2}{T^2} = \frac{GM}{R^{7/2}} \quad \text{i.e. } T^2 \propto R^{7/2}$$

27.

(b) $T^2 \propto r^3 \ \therefore \ \frac{T_1}{T_2} = \left(\frac{r_1}{r_2}\right)^{3/2}$

28.

29.

30.

31.

32.

33.

(d) Work done during the displacement from radius 2R to 4R is equal to change in P.E.

$W = P.E._2 - P.E._1$

34.

35.

(b) Critical velocity of a satellite revolving close to earth $v_c = \sqrt{\frac{GM}{R}}$

Escape velocity of a satellite from earth surface

$$v_e = \sqrt{\frac{2GM}{R}} = \sqrt{2}\, v_c = 1.41\, v_c$$

Percentage increase in velocity $= \frac{v_e - v_c}{v_c} \times 100$

$$= \frac{1.411 v_c - v_c}{v_c} \times 100 = 41.4\%$$

36.

37.

(d) KE of projection = Increase in PE

$$\frac{1}{2} \times mv^2 = mgh \quad \text{i.e.} \quad \frac{1}{2} m \left(\frac{v_e}{3}\right)^2 = mgh$$

$$\frac{1}{2} \frac{m \times 2 \times gR}{9} = mgh \quad \left(\because v_e = \sqrt{2gR}\right)$$

$$h = R/9$$

38.

39.

40.

(c) $s = ut + \frac{1}{2}at^2$. As $s_e = s_m$

$$\frac{1}{2} g_e t_e^2 = \frac{1}{2} g_m t_m^2 \quad \therefore \frac{t_e^2}{t_m^2} = \frac{g_m}{g_e} \quad \text{i.e.} \quad \frac{t_m^2}{t_e^2} = 6$$

$$t_m^2 = 6t^2 \qquad t_m = \sqrt{6}\, t$$

41.

(b) Above earth's surface $g_h = \frac{gR^2}{(R+h)^2}$

At a depth d $g_d = g\left(\frac{1-d}{R}\right)$

On earth's surface g is maximum so, graph (b) is correct.

42.

(d) Present speed of rotation of earth about its own axis $\omega = \frac{2\pi}{T} = \frac{2\pi}{24\times60\times60} rad/s$

In order that bodies on equator fly off its speed should be in equation $g_1 = g - R\omega_1^2$

$0 = g - R\omega_1^2$ i.e. $\omega_1 = \sqrt{g/R} = \sqrt{\frac{9.8}{6.4\times10^6}}$

$\omega_1 = \sqrt{\frac{98}{64\times10^6}} = \frac{10}{8}\times10^{-3}$

$\frac{\omega_1}{\omega} \approx \frac{10\times10^{-3}}{8}\times\frac{24\times60\times60}{6.28} \approx 17$

43. (4) Geostationary satellite has a period of 24 hr.

44.

Since the initial velocity of the body is zero, its total energy is

$$E = -\frac{GmM}{r} \quad \text{(i)}$$

where m is the mass of the body, M the mass of the earth and r its distance from the centre of the earth. When the body reaches the earth, let its velocity be v and its distance from the centre of the earth is the earth's radius R. Therefore, the energy now is

$$E = \frac{1}{2}mv^2 - \frac{GmM}{R} \quad \text{(ii)}$$

Equating (i) and (ii) we get

$$v^2 = 2\,GM\left(\frac{1}{R} - \frac{1}{r}\right)$$

Also $g = \frac{GM}{R^2}$. Therefore $GM = gR^2$. Using this in above equation we get

$$v = R\left[2g\left(\frac{1}{R} - \frac{1}{r}\right)\right]^{1/2}$$

Now $r = 2R$ (given). Therefore

$$v = R\left[2g\left(\frac{1}{R} - \frac{1}{2R}\right)\right]^{1/2} = \sqrt{gR}$$

Hence the correct choice is (a).

45. For elliptical orbit, the earth is at one focus of the ellipse. For spherical bodies, the gravitation force is central (or radial). Hence statement (a) is correct. The gravitational force exerts no torque on the satellite. Hence the angular momentum of S remains constant in magnitude as well as direction. Hence choice (b) is incorrect. For elliptical orbit, the distance of the satellite from the earth varies periodically. Hence potential energy, kinetic energy and linear momentum vary periodically. Hence choices (c) and (d) are also incorrect.

46. (4)
For the given reaction,
$$\frac{-d[A]}{dt} = -\frac{1}{2}\frac{d[B]}{dt} = \frac{1}{3}\frac{d[C]}{dt} = \frac{d[D]}{dt}$$

47. $\frac{K_1+10}{K_1} = 2,3$, i.e.,temperature coefficient is the ratio of rate constant at two temperature differing by 10ºC, preferably at 35ºC and 25ºC

48. (2)
$t_{1/2} \propto (a)^{1-n}$

49. (4)
A decrease in E_a will increase rate constant K and thus rate of reaction increases.

50. (4)
$K_1 = A_1 e^{-E_1/RT}$ and $K_2 = A_2 e^{-E_2/RT}$
$\frac{K_1}{K_2} = \frac{A_1}{A_2} e^{(-E_1+E_2)/RT}$; A_1 and A_2 are not given.

51. (2)
The rate expression is derived from slowest step of mechanism.

52. (1)
K does not change with time; Also unit of K suggest it to be 2^{nd} order.

53. (3)
$$\frac{K_1+10}{K_1} = \frac{r_1+10}{r_1} = 2$$
For an increase of temperature to 60ºC i.e. 6 times, the rate increases by 2^6 times.

54. (3)
$$2.303\log\frac{K_2}{K_1} = \frac{E_a}{R}\left[\frac{T_2-T_1}{T_1T_2}\right];$$
$$\therefore \quad 2.303\log\frac{K_2}{K_1} = \frac{65\times10^3}{8.314}\left[\frac{25}{298\times273}\right]$$
$$\therefore \quad \frac{K_2}{K_1} = 11.05$$

55. (2)
Time required to complete a definite fraction is independent of initial concentration.

56. (2)

$K = Ae^{-E_a/RT}$

At $T = \infty$, $K = A = 6 \times 10^{14}\ sec^{-1}$

57. For I order $K_1 = \frac{0.693}{t_{1/2}}$;

For II order $K_2 = \frac{1}{t_{1/2}a}$

$K_1 = \frac{0.693}{T_1}$; $K_2 = \frac{1}{T_2 a}$

if $T_1 = T_2$ then $\frac{K_1}{K_2} = 0.693a$

Initially $r_1 = K_1[a]^1$

$r_2 = K_2[a]^2$

$\therefore \quad \frac{r_1}{r_2} = \frac{K_1}{K_2 a}$

$= \frac{K_2 \times 0.693 \times a}{K_2 \times a} = 0.693$

58. (2)

For a first order reaction $kt = 2.303 \log \frac{a}{(a-x)}$

or $t = \frac{2.303}{k} \log a - \frac{2.303}{k} \log(a-x)$

y = c + mx

Thus slope $m = -\frac{2.303}{k}$

if log $(a-x) = \log a - \frac{kt}{2.303}$

then slope is $-\frac{k}{2.303}$

59. (2)

$\text{Rate} = K[A]^1[B]^1 = K\left[\frac{[0.2]}{0.1}\right]\left[\frac{[0.2]}{0.1}\right]$ is maximum

60. (2)

$r = K[A]^m; 6.25r = K[2.5A]^m$

$\therefore \quad 6.25 = (2.5)^m$ or $(2.5)^2 = (2.5)^m$

$\therefore \quad m = 2$

61. (3)

$\because \ t = \frac{2.303}{\lambda}\log\frac{A_0}{A}$; if $t = t_{1/4}$,

$\therefore \ t_{1/4} = \frac{2.303}{\lambda}\log\frac{A_0}{3A_0/4} = \frac{2.303}{\lambda}\log\frac{4}{3}$

62. (1)

For zero order $t_{1/2} \propto (a)^1$

or $t_{1/2} = K\cdot(a)^1 + 0$

$y = mx + c$

Also $k = \tan 45 = 1$

63. (4)

If K_1=K_2 then $10^{15}\exp^{-\left(\frac{2000}{T}\right)} = 10^{14}\exp^{\left(\frac{-1000}{T}\right)}$

or $15 - \frac{2000}{T\times 2.303} = 14 - \frac{1000}{T\times 2.303}$

$\therefore \ \frac{1000}{T\times 2.303} = 1$

$\therefore \ T = \frac{1000}{2.303} = 434.22$

64. (4)

Consider a reaction $A \rightarrow$ Product

$\therefore \ r_1 = K[A]^1$ for I order …(1)

$\therefore \ r_2 = K[A]^2$ for II order …(2)

$\therefore \ r_3 = K[A]^3$ for III order …(3)

$\because$ K is same in all

If [A] = 1, $r_1 = r_2 = r_3$

If [A] < 1, $r_1 > r_2 > r_3$

If [A] > 1, $r_3 > r_2 > r_1$

65. (3)

Unit of K= $(mol)^{1-n}(litre)^{n-1}\ time^{-1}$, where n is order of reaction $n = 1 + \frac{2}{3} = \frac{5}{3}$

66. (3)

Since rate constant = 1.0×107 mollitre–1 sec–1

Zero order reaction.

For zero order $t = \frac{x}{K} = \frac{\text{concentration used}}{\text{rate constant}}$ …(1)

$\because$ 0.05 mL has 3×10^{-6} moles of H^+

$\therefore$ 1000 mL has $\frac{3\times10^{-6}\times10^3}{0.05} = 0.6\times10^{-1}$ mollitre^{-1} of H^+

$\therefore$ By Eq. (1), $t = \frac{0.6\times10^{-1}}{1\times10^7} = 6\times10^{-9}$ second

67. (2)

At pH =5, the half life is 500 for all concentrations of sugar i.e., $t_{1/2} \propto [\text{sugar}]^0$. Thus, the reaction is I order with respect to sugar.

Now rate = K=[sugar]1[H^+]^m

Also for $[H^+]t_{1/2} \propto [H^+]^{1-m}$

$\therefore \quad 500 \propto [10^{-5}]^{1-m}$

$50 \propto [10^{-6}]^{1-m}$

$\therefore \quad 10 = (10)^{(1-m)}$

or (1–m) = 1

$\therefore$ m = 0

Therefore, rate = K[sugar]^1[H^+]^0

68. (1)

$$\log\frac{k_2}{k_1} = \frac{E_0}{2.303R}\left[\frac{1}{T_1} - \frac{1}{T_2}\right]$$

69. (1)

Self explanatory

70. (1)

$$\log\frac{k_2}{k_1} = \frac{E_0}{2.303R}\left[\frac{1}{T_1} - \frac{1}{T_2}\right]$$

Since E_a = 0

$\therefore \quad \frac{k_2}{k_1} = \text{antilog } 0 = 1$

or $k_2 = k_1 \times 1 = 3.2 \times 10^6 \text{ s}^{-1}$

71. (1)

$r = k[A]$ …. Given

$$t = \frac{2.303}{k}\log\frac{[A_0]}{[A]}$$

$$t = \frac{2.303}{6}\log\frac{[0.5]}{[0.05]} = \frac{2.303}{6} = 0.384\,\text{min}$$

72. (3)

$r = k[A]^2$

Hence doubling con.of A will increase the rate by four times.

73. (1)

$r = k[CH_3COOH][C_2H_5OH]$

or $r = k\left[\frac{n}{V}\right]\left[\frac{n}{V}\right]$

increasing V by twice (due to dilution)will reduce the rate by 4 times

74. (2)
$t_{0.75} = 2t_{1/2}$
$\therefore \quad t_{1/2} = \frac{30}{2} = 15\,\text{min}$
$100 \xrightarrow{t_{1/2}} 50 \xrightarrow{t_{1/2}} 25 \xrightarrow{t_{1/2}} 12.5 \xrightarrow{t_{1/2}} 6.25$
Hence to complete 93.75%, four half lives are required i.e., 15×4 = 60 min

75. (4)
Self explanatory

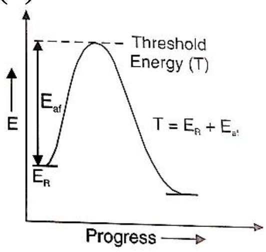
76. (2)
Eq. constant, $K = \frac{k_f}{k_b} = \frac{2}{1} = 2.0$

77. (3)
Self explanatory

78. (2)
See summary for writing rate expressions

79. (2)
Self explanatory

80. (3)



81. (3)
$k = \frac{2.303}{t}\log\frac{100}{90}$
$= \frac{2.303}{5}\log\frac{10}{9} = \frac{2.303}{5}\times 0.045$
$= 0.021\ s^{-1}$
Hence amount left after 25 sec
$\frac{0.021\times 25}{2.303} = \log\frac{[100]}{A}$
or 0.228 = 2 – log [A]
log[A] = 2 – 0.228 = 1.772
[A] = 59.156 = 60%

82. (4)
Self explanatory

83. (4)
No hint

84. (3)
Molecularity is always a whole number.

85. (4)
$r_{formation}$ of SO_3=$r_{disappearance}$ of SO_2 in mole unit

86. (4)
$$t_{1/2} = \frac{0.693}{k} = \frac{0.693}{1.155\times10^{-3}} = 600\,\text{sec}$$

87. (2)
Self explanatory

88. (3)
Rate of disapp.of $H_2 = \frac{3}{2}$ rate of app. Of NH_3
$$\therefore \quad -\frac{\Delta[H_2]}{\Delta t} = \frac{3}{2}\times2\times10^{-4} = 3\times10^{-4}\,\text{mol}\,L^{-1}\,s^{-1}$$

89. (2)
$$k = \frac{2.303}{t}\log\frac{[A_0]}{[A]}$$
$$k = \frac{2.303}{30}\log\frac{100}{70}$$
$$k = \frac{2.303}{30}(\log100 - \log70)$$
$$k = \frac{2.303}{30}\times0.155 = 0.01189$$
$$t_{1/2} = \frac{0.693}{0.01189} = 58.2\,\text{min}$$

90. (2)
$$t_{1/2} = \frac{0.693}{0.693\times10^{-2}} = 10^2\ \text{min}$$

91. Each daughter chromosome consist of only one chromate
Rest three statements are correct
92. Daughter cells are genetically dissimilar to each other and from parent.
93. Meiotic division reduces the number of chromosomes maintaining the ploidy at each generation no other division can reduce the chromosome number
94.
95. In angiospersm, 1MMC forms 4 pollen grain by meiosis each pollen grain forms 2 male gametes hence to form 80 male gametes, 40 pollen grains are required. To form 40 pollen grains, 10 MMC will show 10 meiosis
96. NCERT pg no. 163
97. Amount of DNA doubles in ‘s’ phase, hence after ‘s’ phase the content appears double. Thus G_2 & m
98. NCERT Pg no. 168
99. NCERT Pg no. 168
100. NCERT Pg no. 168

101. Use the formula $n+\frac{n}{4}$, n = no. of wheat grains

$\therefore 200+\frac{200}{4}=250$

102. In anaphase 1, homologous chromosome separate and anaphase 2, sister chromatids separate
103. NCERT – Pg 168
104. Mitosis leads to formation of 2 diploid cells &
Meiosis leads to formation of 4 haploid cells
105. ‘S’ phase in synthesis phase, quiescent phase is Go.
106.
107. NCERT – Pg no. 165
108. NCERT – Pg no. 166
109. NCERT Pg no. 168,169
110. NCERT Pg no. 168
111. Least multiplies in 90 mins. In 24 hours 16 generation of yeast can be seen.
Thus Q = 2 , S = 2^{16}
Human cell multiplies in 24 hours
Thus P – 1, R = 2
112. Meiosis occurs in sex cells, reducing the chromosome number from 2n ton.
113. NCERT – Pg no. 168
114. In mitosis, homologous chromosomes behave independently
115. NCERT – Pg no 168
116. Syncytium is a cell containing many nuclei
117.
118. NCERT – Pg no 166
119. NCERT – Pg no 163
120.
121.
122. NCERT – Pg no 163
123. NCERT Pg no. 164
124. Colchicine is obtained from colchicum
125. Zygole is formed after repeated mitosis
126. Meiocyte = 2n = 16 pg
Gamete = n = 8 pg
127. Daughter cells formed after meiosis are genetically dissuader
128. “Meiosis” was coined by farmer & moore
129. Apply formula 2^n = total cells, 2^n = 128 $\therefore$ n = 7
130. Centiomere does not split in meiosis = 1
131. Mitotic anaphase has same no. of chromosomes but half no. of chromatid than metaphase
132. NCERT – Pg no 163
133. NCERT – Pg no 167
134. Segregation occurs in anaphase 1
135. Synapsis is seen in meiosis
137. B cells secrete antibodies.
139. Arteries have thick tunica media rich with smooth muscles and elastin protein.
140. Capillaries are single layered endothelium and hence thinnest blood vessel

141. Systemic circulation starts with left ventricle and ends at right atrium
143. Lymphatic vessels of small intestine are called lacteals .
144. Pleura is the cover of Lungs.
145. Heart beat is accelerated by sympathetic neural system secreting epinephrine.
146. Blood pressure is highest during ventricular systole.
147. All the mentioned veins open in right atrium except pulmonary veins that open in left atrium.
148. Aorta being artery shall be having thickest tunica media and hence most elastic.
150. Atherosclerosis is plaque deposition in the inner wall of arteries.
153. Pulse pressure =120-80=40mm of Hg
154. Fibrinogen is a type of blood clotting factor.
155. Rabbit being mammal shall have 4 chambered heart.
156. The opening of major arteries is guarded by semilunar valves.
157. Eosinophil count increases during allergy as its anti inflammatory.
159. Eosinophil is antagonistic to basophil and hence anti histaminic.
160. Thromboplastin clotting factor is the initiator of clotting.
161. Chordae tendinae of ventricles support AV valves.
163. Vertebrate heart is myogenic in nature ie autorythmic.
164. Rh antigen on RBC is absent in Rh- blood group.
166. Platelets are formed by fragmentation of megakaryocyte.
167. HDN occurs when Rh- mother carries a Rh+ child during her second pregnancy.
168. Heart attack occurs due to sudden damage or death of cardiac muscles.
169. Vital centres of life are located in Medulla.
171. Lymph or tissue fluid is plasma with less proteins
172. RBC has Haemoglobin.
174. Basophil is histaminic and eosinophil is anti histaminic.
175. Ventricular systole lasts for 0.3sec during which AV valves prevent back flow of blood.
177. SA node is pacemaker of heart that maintains rhythmic heart rate.
178. Opeining of Aorta ,pulmonary artery and veins at regular intervals have semi lunar valves.
179. Amphibians have 3 chambered heart.Shark has 2 chambered venous heart.