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1st Online Practice Test XII-PMT Solution & Answer - Key

Physics

1. c

$F = \frac{1}{4\pi \epsilon_0} \frac{Q_1 Q_2}{d^2}$

$E_0 = \frac{Q_1 Q_2}{4\pi F d^2}$

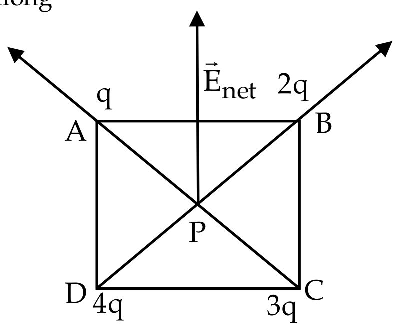
$= \frac{C^2}{Nm^2}$

2. c

will remain uncharnged. Electrostatic force b/w two charges is independent of the presence of other charges.

3. a

E_{along} PA



$= \frac{3q}{4\pi\varepsilon_0 q^2} - \frac{q}{4\pi\varepsilon_0 d^2}$

$= \frac{2q}{4\pi\varepsilon_0 d^2}$

E_{along}

PB

$= \frac{4q}{4\pi\varepsilon_0 d^2} - \frac{2q}{4\pi\varepsilon_0 d^2}$

$= \frac{2q}{4\pi\varepsilon_0 d^2}$

$\vec{E}_{net}$ has same direction that of CB.

4. a

For constant potentials, the charges are fixed

so, $F_{air} = \frac{1 Q_1 Q_2}{4\pi\varepsilon_0 d^2}$

$F_{medium(k)} = \frac{Q_1 Q_2}{4\pi K \varepsilon_0 d^2}$

$\boxed{\frac{F_{air}}{F_{medium}} = \frac{K}{1}}$

5. a Given $v = 4x^2$ volt

$E = \left(\frac{-dv}{dx}\right) = -8x$

$E(1m_1, 2m) = -8 \times 1$

= - 8 N/c

Electric field is 8 along negative x-axis.

6. a

Here

$V_r - V_{3r} = V$

$\frac{Q}{4\pi\varepsilon_0 r} - \frac{Q}{4\pi\varepsilon_0 3r} = V$ [Say charge on shell]

$Q = \frac{4\pi\varepsilon_0 V.3r}{2}$

Now; $E_{at3r} = \frac{Q}{4\pi\varepsilon_0 (3r)^2} = \frac{4\pi\varepsilon_0 v.3r}{2 \times 4\pi\varepsilon_0} qr^2$

7. a

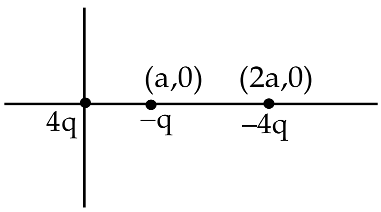
8. b

Tacing a Gaussian surface, like a sphere of radius r we have

$E.4\pi r^2 = \frac{P \times \frac{4}{3}\pi r^3}{\varepsilon_0}$

$\boxed{E = \frac{fr}{3\varepsilon_0}}$

9. c



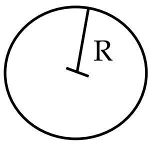
Given;

Here,

F_{net} on any of the three charges are zero, but if any charge is pushed along y-axis they will have no restoring force.
Thus
Unstable equilibrium.

10. d

radius of smaller drops = r
Then,



$\frac{q_0}{4\pi\varepsilon_0 r} = V$

$q_0 = 4\pi E_0 r$

Now; conserving volume –

$\frac{4}{3}\pi R^3 = \frac{4}{3}\pi r^3 n$

$R = n^{1/3} r$

Now
New potential or surface of larger drop.

$V' = \frac{nq_0}{4\pi\varepsilon_0 R}$

$= \frac{4\pi\varepsilon_0 r.n.V}{4\pi\varepsilon_0 n^{1/3} r}$

$\boxed{V' = n^{2/3} V}$

11. b

Let the capacitance be c on inserting dielectric constant k new capacitance = kc

Energy = $\frac{1}{2}kcv^2$

$= \frac{3}{2}CV^2$

Now, charge = 3cv
When dielectric is replace by k = 2. Then capacitance = 2c

$\therefore$ energy $\Rightarrow \frac{1}{2}\frac{(3cv)^2}{2c}$

$\Rightarrow \frac{9c^2v^2}{4c}$

$\frac{\text{Energy later}}{\text{Energy initial}} = \frac{\frac{9c^2v^2}{4c}}{\frac{3}{2}cv^2}$

$= \frac{9}{4} \times \frac{2}{3}\frac{cv^2}{cv^2}$

$= \frac{3}{2}$

12. b
13. b
14. d
15. c
16. b
17. b
18. a

Here,
Time constant = RC
$= 6 \times 2$
$= 12$

Now,

$Q = Q_0 e^{-\frac{t}{\tau}}$

$Q = Q_0 e^{-12/12}$

$Q = Q_0 / e$

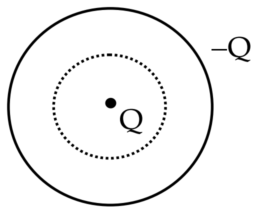
and $Q_0 = cv$

$= 2 \times 5 = 10$ c

$Q = \left(\frac{10}{e}\right)c$

19. c
20. a

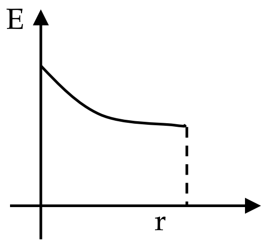
Electric field inside the shell.
Taking a Gaussian
Surface of radius r < R



$4\pi r^2 E = \frac{Q}{E_0}$

$E = \frac{Q}{4\pi E_0 r^2}$

Electric field outside the shell = 0



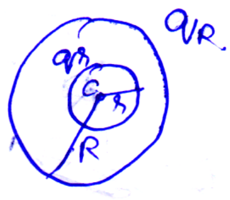
21. c $3ax = A \Rightarrow a \times x = \frac{A}{3}$

$\Rightarrow A_0 = \frac{A}{3}$

$\therefore C_{net} = \frac{\epsilon_0 A_0}{d} + \frac{\epsilon_0 A_0}{d+b} + \frac{\epsilon_0 A_0}{d+2b}$

$= \frac{\epsilon_0 A_0}{3}\left[\frac{1}{d} + \frac{1}{d+b} + \frac{1}{d+2b}\right]$

22. c $V_c = V_R + V_C$.

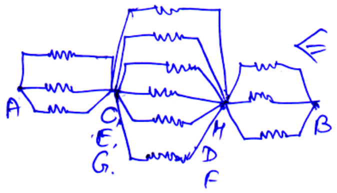


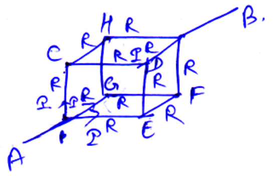
$= \frac{qR}{4\pi\epsilon_0 R} + \frac{qr}{4\pi\epsilon_0 r}$

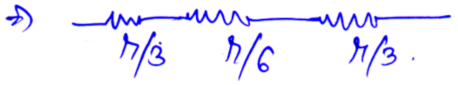
$= \frac{6\times 4\pi R^2}{4\pi\epsilon_0 R} + \frac{6\times 4\pi R^2}{4\pi\epsilon_0 R}$

$= \frac{6}{\epsilon_0}(R+r)$

23. a







$V_C = V_E = V_G$

$V_H = V_D = V_F$

$$\text{Req} = \frac{r}{3} + \frac{r}{6} + \frac{r}{3} = \frac{2r + r + 2r}{6} = \frac{5r}{6}$$

24. c For particle A and B

F is same, m = same T is same

$\therefore\ \alpha = \beta$

25. d

$$V = \frac{Q}{4\pi \epsilon_0 R}$$

$$U_i = \frac{1}{2}CV^2 = \frac{Q^2}{(4\pi \epsilon_0 R)^2} \times \frac{(4\pi \epsilon_0 R)^2}{2}$$

$$U_i = \frac{Q^2}{8\pi \epsilon_0 R}$$

$$C_f = \frac{4\pi \epsilon_0}{\frac{1}{R} - \frac{1}{2R}} = 8\pi \epsilon_0 R$$

$$U_f = \frac{Q^2}{2C} = \frac{Q^2}{2 \times 8\pi \epsilon_0 R} = \frac{Q^2}{16\pi \epsilon_0 R}$$

$$\text{Loss in heat} = U_i - U_f = \frac{Q^2}{16\pi \epsilon_0 R}$$

26. a $C = kC_0$ V = constant, E = Constant $= \frac{V}{d}$

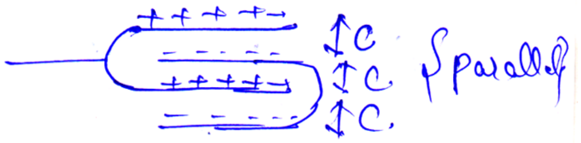
$Q = CV \Rightarrow KC_0V = KQ_0$

$$U = \frac{1}{2}CV^2 = \frac{1}{2}KC_0V^2 = KU_0$$

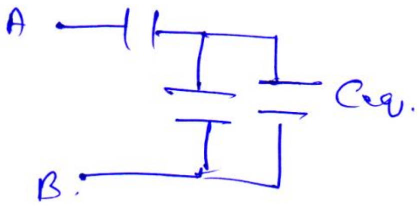
27. c

$\text{Ceq} = 3C$

$$= \frac{3 \epsilon_0 A}{d}$$



28. c



$$\text{Ceq} = \frac{(C + \text{Ceq})C}{2C + \text{Ceq}}$$

$$\Rightarrow \text{Ceq} = \frac{2(2 + \text{Ceq})}{4 + \text{Ceq}}$$

$$\Rightarrow \text{Ceq}^2 + 4\text{Ceq} = 4 + 2\text{Ceq}$$

$$\Rightarrow \text{Ceq}^2 + 2\text{Ceq} - 4 = 0$$

$$\text{Ceq} = \frac{-2 \pm \sqrt{4 + 16}}{2}$$

$$= -\frac{2 \pm \sqrt{20}}{2}$$

$$\text{Ceq} = \sqrt{5} - 1$$

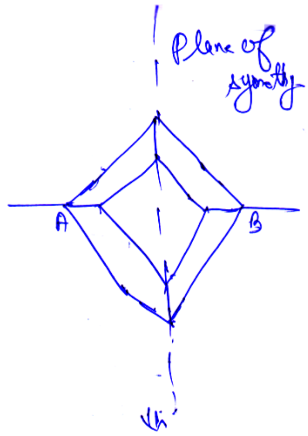
29. c

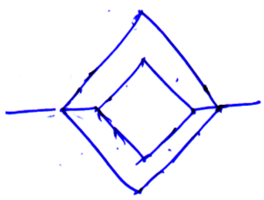
$$\frac{1}{\text{Req}} = \frac{1}{2r} + \frac{1}{2r} + \frac{1}{3r}$$

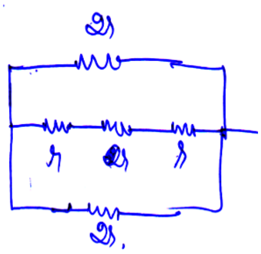
$$= \frac{3 + 3 + 2}{6r}$$

$$\frac{1}{\text{Req}} = \frac{8}{6r}$$

$$\text{Req} = \frac{3}{4}r = \frac{3}{4}\Omega$$







30. a

$$V = qV,\ \text{Req} = \frac{9}{9} = 1A.$$

$$\text{Ceq} = \frac{3 \times 6}{3 + 6} = 2\mu F$$

$Q = C \times V = 2 \times 9 = 18\mu C$

V across

$$3\mu F = \frac{Q}{4} = \frac{18}{3} = 6V$$

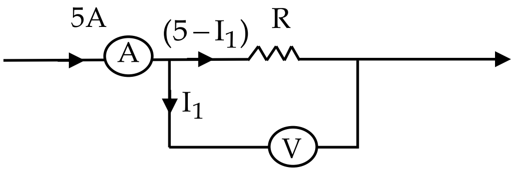
V across

$$6\mu F = \frac{Q}{C_2} = \frac{18}{6} = 3V$$

V across $3\Omega = I \times R = 1 \times 3 = 3V$

V across $6\Omega = I \times R = 6\,V$

31. c

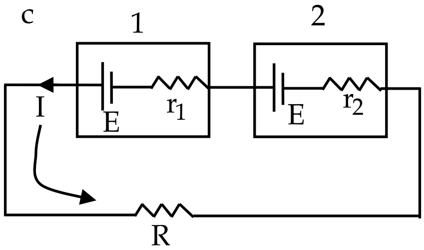


$R(5-I_1)=20$

$R=\frac{20}{5-I_1}$

Hence R > 4 Ω

32. c



Potential difference across cell 1 is zero.

$\therefore\ E-Ir_1=0$

$\boxed{I=\frac{E}{r_1}}$

Apply K.V.L. in circuit

$E-\frac{E}{r_1}R-\frac{E}{r_1}r_2=0$

$E=\frac{ER}{r_1}+\frac{Er_2}{r_1}$

$1=\frac{R}{r_1}+\frac{r_2}{r_1}$

$r_1=R+r_2$

$\boxed{R=r_1-r_2}$

33. c

Bulb B_1 will became dimmer because on removing B_2 or B_3 effective resistance of circuit will increase i.e. load increases.

34. c $\frac{mv}{qB}=r\quad \frac{mv^2}{r}=quB$

$\therefore\ \pi r^2=\left(\frac{mv}{qB}\right)^2\pi$

$\therefore$ Area $\alpha\ \frac{m^2v^2}{qB}\alpha\, mv^2$

$\therefore$ Area α K.E.

35. b Since the electron moving with constant velocity.

$\therefore$ Magnetic force = Electric force

qvB = qE

vB = E

$v=\frac{E}{B}=\frac{20}{0.5}=40\ m/s$

36. a

Since both circular coil are at right angle

$\therefore$ magnetic induction of coils also make right angle.

$\therefore\ B_1=\frac{N\mu_0 i}{2r}=\frac{150\times 4\pi 10^{-7}\times 200\times 10^{-3}}{2\times\pi}$

$=\ 300\times 200\times 10^{-3}\times 10^{-7}$

$=\ 60000\times 10^{-10}$

$=\ 6\times 10^{-6}\frac{Wb}{m^2}$

$B_2=\frac{400\times 4\pi\times 10^{-7}\times 200\times 10^{-3}}{2\times 2\pi}$

$=\ 400\times 10^{-7}\times 200\times 10^{-3}$

$=\ 80000\times 10^{-10}$

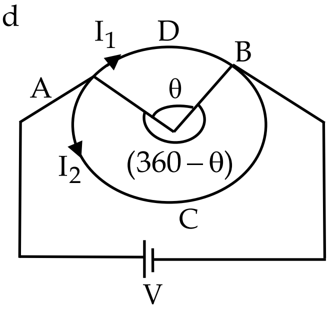
$=\ 8\times 10^{-6}wb/m^2$

$\therefore\ B_{net}=\sqrt{B_1^2+B_2^2}$

$=\sqrt{(6\times 10^{-6})^2+(8\times 10^{-6})^2}$

$=\ 10\times 10^{-6}=10^{-5}\frac{Wb}{m^2}$

37. d



Magnetic field direction due to ADB are opposite to ACB and their magnitude are equal for all θ.

Hence Net magnetic field will be zero for all value of θ.

38. (d) $B\propto\frac{1}{x^3}$

39. c

A proton can not change velocity, if there is E and B both present or B have some value and E = 0.

40. a

Since Torque = $\vec{m}\times\vec{B}$ in both ring $\vec{m}$ and $\vec{B}$ are perpendicular so it produce a torque which rotates the coil into a common plane.

41. b

Magnetic field does not charge the speed hence v = u. Magnetic field exert a force such that it change the direction of motion and it come out at y < 0

42. d

Magnetic field due to part lie in z-y plane is in x-direction. Magnetic field due to part lie in y-x plane in z direction.

43. a

Magnetic field is given by

$$= \frac{\mu_0 I}{2\pi\sqrt{x^2+y^2}}\left(\frac{y\hat{i}-x\hat{j}}{\sqrt{x^2+y^2}}\right)$$

$$= \frac{\mu_0 I}{2\pi}\frac{\left(y\hat{i}-x\hat{j}\right)}{\left(x^2+y^2\right)}$$

44. b

only $\vec{F}_{net}$, due to condition given in option (b) act in x-y plane

45. c

Option (c) is wrong because $\vec{F}_E$ is not perpendicular to $\vec{v}$. So power = $\vec{F}\cdot\vec{v}$ must not be zero.

Chemistry

46. (c) $\frac{P^o - P_s}{p^o} = X_{solute}$

47. (b) As per ostwald dilution law

$\alpha = \sqrt{\frac{K}{C}}$

So on dilution, C decreases

and hence dissociation increases

48. (c) $r = -\frac{1}{2}\frac{\Delta[X]}{\Delta t} = -\frac{\Delta[Y]}{\Delta t} = +\frac{\Delta[Z]}{\Delta t}$

$\therefore$ rate of appearance of z = $\frac{\text{rate of disappearance of } x}{2}$

49. (a) Distance of closest approach between

two atom = $\frac{\text{diagonal}}{2} = \frac{\sqrt{3}a}{2}$

$\therefore \frac{\sqrt{3}a}{2} = 1.73$

$a = 2\overset{o}{A}$ = 200 pm

50. (c) Sp. reaction rate depends on reactant, temp. & catalyst

51. (b) Mole= $M \times V(\text{ltr.})$

52. (b) $A_{2(g)} \longrightarrow B(g) + \frac{1}{2}(g)$

$t = 0$	100	0	0
$t = 5$ min	$(100 - x)$	x	$\frac{x}{2}$

$$100 - x + x + \frac{x}{2} = 120$$

$x = 40$

rate = $\frac{40}{5} = 8$

53. (c) $P_{Total} = x_A P_A^o + x_B P_B^o$

$= x_A P_A^o + (1 - x_A) P_B^o$

$x_A = \dfrac{P_{Total} - P_B^o}{P_A^o - P_B^o}$ ..... (i)

Also $y_A = \dfrac{P_A}{P_{Total}} = \dfrac{x_A P_A^o}{P_{Total}}$

$x_A = \dfrac{y_A\, P_{Total}}{P_A^o}$ ..... (ii)

equating both eq. we get

$\dfrac{1}{P_{Total}} = \dfrac{1}{P_B^o} - \dfrac{P_A^o - P_B^o}{P_A^o P_B^o} y_A$

or $\dfrac{1}{P_{total}} \propto y_A$

54. (c) Theoretical problem. Refer NCERT

55. (b) Conc. of product increases and becomes const. when reaction completes

56. (b) For NaCl, C.N is 6

$\therefore \dfrac{r_{C^+}}{r_{a^-}} = 0.414 - 0.732$

57. (c) As per rate determining step (slow step)

$r = K[A][B_2]$

[A] is reaction intermediate and has to be eliminated

$K_C = \dfrac{[A]^2}{[A_2]}$

$[A] = K_C^{1/2} [A_2]^{1/2}$

$\therefore r = KK^{1/2}[A_2]^{1/2}[B_2]$

Order = $\dfrac{1}{2} + 1$

58. (b) Applying Kohlravsch law

$\wedge^{\infty}_{NH_4Cl} = \wedge^{\infty}_{NH_4^+} + \wedge^{\infty}_{Cl^-} = 149.74$ .....(i)

$\wedge^{\infty}_{NaOH} = \wedge^{\infty}_{Na^+} + \wedge^{\infty}_{OH^-} = 248.1$ ..... (ii)

$\wedge^{\infty}_{NaCl} = \wedge^{\infty}_{Na^+} + \wedge^{\infty}_{Cl^-} = 126.4$ ...... (iii)

adding (i) & (ii) and subtracting (iii)

$\wedge^{\infty}_{NH_4} + \wedge^{\infty}_{OH^-} = 211.44 = \wedge^{\infty}_{NH_4OH}$

59. (c) Since A is more volatile so vapour content of A will be more as compared to liquid content

60. (c) Theoretical problem

61. (c) Theoretical problem. Refer NCERT

62. (b) $\dfrac{(t_{1/2})_1}{(t_{1/2})_2} = \left(\dfrac{a_2}{a_1}\right)^{n-1}$

$\dfrac{5}{5} = \left(\dfrac{0.1}{0.2}\right)^{n-1}$

$1 = \left(\dfrac{1}{2}\right)^{n-1}$ $n = 1$

63. (a) Acetone & chloroform show $-ve$ deviation
64. (c) Theoretical problem. Refer NCERT
65. (d) CsCl has 8 : 8 arrangement
$\therefore$ Tl^+ has 8 C.N
66. (b) $E_{cell} = \left(E^o_{O_A} + E^o_{R_C}\right)$

$0.8V = \left(O + E^o_{R_C}\right)$

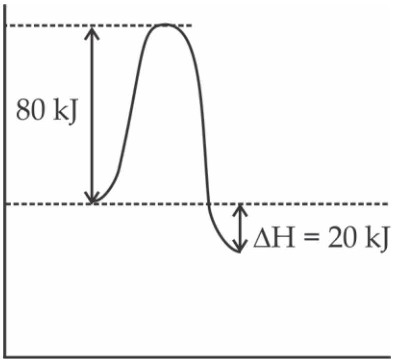
$E^o_{R_C} = 0.8V$

$E^o_{O_C} = -0.8V$

67. (c) $\Delta H = E_{a_f} - E_{a_f}$

$-20 = 60 - E_{a_f}$

$E_{a_b} = 80\ kJ$



68. (b) Greater interactions between $A-B$
it show negative deviation.
69. (c) Reduction of H_2O
70. (c) $\underset{+7}{MnO_4^-} \longrightarrow \underset{+2}{Mn^{2+}}$

Change in 0.5 = 5

$5 \times 96500^o C$

$4.83 \times 10^5 C$

71. (d) $K = \frac{2.303}{32}\log\frac{100}{1} = \frac{2.303 \times 2}{32}$ .... (1)

$K = \frac{3.302}{t}\log\frac{100}{.1} = \frac{2.303 \times 3}{t}$ ..... (2)

$\frac{2.303 \times 2}{32} = \frac{23.3 \times 3}{t}$

$t = 48 \min$

72. (d) $Cu = 8 \times \frac{1}{8} = Cu$

$Ag = 6 \times \frac{1}{2} = 3Ag$

$Au = 1 = Au$

73. (d) A/C collision theory.
threshold energy and proper orientation both
74. (b) $i = 1 + (n-1)2$

$= 1 + (3-1)$

= 3

75. (a) Solid

76. (b) Schottky defect

77. (c) $Zn + Pb^{2+}(1m) \longrightarrow Zn^{2+}(0.1) + Pb$

$$E_{cell} = (E^o_{O_A} + E^o_{R_C}) - \frac{0.0591}{n}\log\frac{[Zn^{2+}]}{[Pb^{2+}]}$$

$$= [0.763 - 0.126] - \frac{0.0591}{2}\log\frac{0.1}{1}$$

$= .637 + .02955$

$= .6665V$

78. (a) ≈ 2

79. (b) $Fe^{3+} = x$

$Fe^{2+} = 0.93 - x$

$3x + 2(0.93 - x) - 2 = 0$

$x = .14$

$$\frac{.14}{.19} \times 100 = 15\,\%$$

80. (b) $2H^+ + 2e^- \longrightarrow H_2$

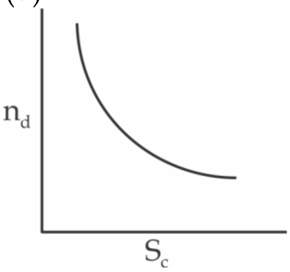
$$E_{cell} = E^o - \frac{0.0591}{2}\log\frac{1}{(H^+)^2}$$

$$= 0 - \frac{0.059}{2}\log\frac{1}{(10^{-10})^2}$$

$= .591V$

81. (d) hydrophobic sol.

82. (d)



83. (c) Azeotropic mixture not be separated.

84. (a) $\frac{r_+}{r_-} = \frac{94}{146} = 0.643$ Octahedral

85. (a) $\Delta G^o = -2.303RT\log K_C$

$\Delta G^o = -nFE^o$

$$E^o = \frac{0.0591}{n}\log K_C = 0.354V$$

86. (c) Specific conductance increase with dilution because number of ions P_{ev} unit volume decrease.

87. (a) $i = 3$

88. (b)

89. (a) $$\frac{\frac{2(K^+ + Cl^-)}{Cl^-}}{\frac{2(Na^+ + Cl^-)}{Cl^-}} = \frac{3.48}{3.1} = 1.123$$

90. (b) less than 58.5

ANSWER-KEY BIOLOGY

91.	a	106.	c	121.	c	136.	a	151.	b	166.	a
92.	a	107.	c	122.	b	137.	b	152.	c	167.	c
93.	a	108.	d	123.	c	138.	b	153.	b	168.	b
94.	d	109.	c	124.	b	139.	d	154.	d	169.	b
95.	b	110.	d	125.	a	140.	d	155.	a	170.	c
96.	b	111.	d	126.	d	141.	c	156.	c	171.	b
97.	b	112.	b	127.	a	142.	c	157.	c	172.	c
98.	b	113.	d	128.	a	143.	d	158.	d	173.	a
99.	c	114.	c	129.	d	144.	b	159.	a	174.	b
100.	b	115.	d	130.	b	145.	c	160.	d	175.	b
101.	c	116.	b	131.	a	146.	d	161.	d	176.	b
102.	d	117.	b	132.	a	147.	a	162.	b	177.	c
103.	c	118.	d	133.	b	148.	c	163.	d	178.	d
104.	d	119.	c	134.	d	149.	c	164.	d	179.	d
105.	a	120.	b	135.	a	150.	b	165.	b	180.	a