INJSO – 2011 (Answer Key)
Section A (Multiple Choice Questions)

Q.No.	Ans.
1	a
2	b
3	d
4	a
5	a
6	b
7	c
8	b
9	a
10	a
11	a
12	a
13	c
14	d
15	b
16	c
17	a
18	b
19	a
20	b
21	d
22	a
23	c
24	c
25	b
26	c
27	d
28	b
29	a
30	b
31	d
32	c
33	b
34	b
35	a
36	a
37	c
38	c
39	c
40	c
41	b
42	c
43	c
44	c
45	b
46	b
47	a
48	a
49	a
50	c
51	b
52	b
53	c
54	d
55	b
56	c
57	b
58	d
59	d
60	b

Section B (Long Answer Questions)

Please note that alternate/equivalent solutions may exist.

61. 1. (d) All solutions have lower water potentials than pure water and have negative values of ψ .

2. ψ_p of a flaccid cell is zero.

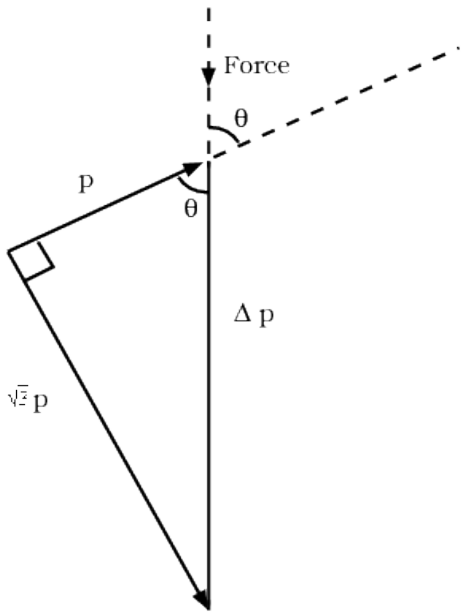
3. A) Cell B
B) Cell B to Cell A

4. ψ = -1000 kPa

5. ψ_p at equilibrium

Cell A	Cell B
$\psi = \psi_s + \psi_p$ = -1000 kPa - (-2000 kPa) = 1000 kPa	$\psi = \psi_s + \psi_p$ = -1000 kPa - (-1400 kPa) = 400 kPa

62. a) Let the initial momentum be 'p'
$\therefore$ Final momentum is $\sqrt{3}p$
Angle turned is 90°. To find $\angle\theta$, (refer the diag.)

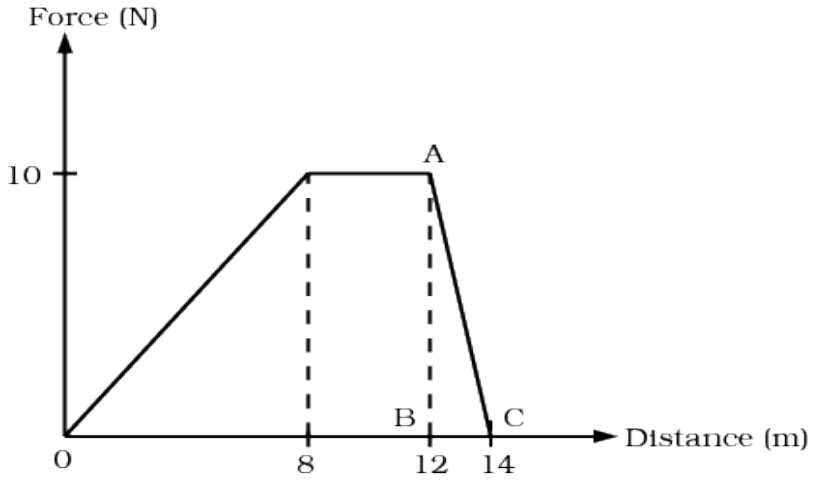


As per the momentum diagram,
using Newton's second law,
Force acts in direction of change in momentum Δp

$\therefore \tan\theta = \frac{\sqrt{3}p}{p} = \sqrt{3}$

$\therefore \theta = 60°$

b)



Work done over the distance of last 2m = Area of Δ ABC

$= ½ \times 2 \times 10$

$= 10$ J

63. a) Element is Chromium, Cr (24)

Electronic configuration: $1s^2 2s^2 2p^6 3s^2 3p^6 3d^5 4s^1$

b) Four s sub shells, two p sub shells, one d sub shell ; 15 orbitals and 6 unpaired electrons

c) 12 and 5 respectively

d) one

e) one

64. 2! = 2

3! = 6

4! = 24

5! = 120

And all subsequent factorials have last digit zero.

So, 1+ 2 + 6 + 24 = 33

Hence, last digit will be 3.

65. i) $\rho_i = 917$ kg·m^{-3}

$\rho_w = 1000$ kg·m^{-3}

$\rho_o = 1024$ kg·m^{-3}

When iceberg floats, $\rho_i V_i = \rho_o V_o$ where V_i is iceberg's volume and V_o is displaced water.

$$V_o = \frac{\rho_i V_i}{\rho_o}$$

$$h \times A = \frac{\rho_i V_i}{\rho_o}$$

where, h = rise in sea level

A = surface area of the sea

$$h = \frac{4 \times 10^3 \times 917 \times 10^9}{3.61 \times 10^8 \times 10^6 \times 1024} \approx 10^{-2} \text{ m} = 1 \text{ cm}$$

ii) After melting

$$\rho_i V_i = \rho_w V_w \quad \Rightarrow \quad V_w = \frac{\rho_i V_i}{\rho_w}$$

where V_w is the volume of water after melting.

$$V_w - V_o = V_i \rho_i \left(\frac{1}{\rho_w} - \frac{1}{\rho_o}\right)$$

$$= V_i \frac{\rho_i(\rho_o - \rho_w)}{\rho_o \rho_w} = V_i \frac{917 \times 24}{1.024 \times 10^6}$$

$$A \times h = \frac{0.4 \times 10^{13} \times 917 \times 24}{1.024 \times 10^6} = 8.57 \times 10^{10}$$

$$h = \frac{8.57 \times 10^{10}}{3.61 \times 10^8 \times 10^6} = 2.38 \times 10^{-4} \text{m} = 0.24 \text{ mm}$$

iii) Water surface area = $\frac{3.61 \times 10^8}{4\pi(6.4)^2 \times 10^{12}} \approx 70\%$

66. a) Any natural number is of the form 2n or 2n+1,

where n is a non-negative integer. Now $(2n)^2 = 4n^2$ is divisible by 4

and $(2n+1)^2 = 4n(n+1) + 1$ leaves 1 as remainder upon division by 4.

b) A simple calculation reveals that n! + 2 = 3,4,8 for n = 1,2,3.

Thus for n = 2 the expression n!+2 is a square of a natural number.

For n greater than 3, n! is divisible by 4.
Therefore the remainder obtained upon dividing n!+2 by 4 is 2.

Hence it cannot be a perfect square.

Therefore the only value of n that makes n!+2 a perfect square is 2.

67. a) (i) 28 cm^3
(ii) 3
(iii) $[HNO_3] = 2.80 \times 10 - 3 \div 0.025$
$= 0.112$ mol dm^{-3}

b)

$S + 3/2\ O_2 \rightarrow SO_3$
$SO_2 + ½\ O_2 \rightarrow SO_3$

$S + 3/2\ O_2 \rightarrow SO_3 \qquad \Delta H_1 = -395$ kJ
$SO_3 \rightarrow SO_2 + ½\ O_2 \qquad \Delta H_2 = +98$ kJ

$S(s) + O_2(g) \rightarrow SO_2$

ΔH (final) = $\Delta H_1 + \Delta H_2$
= -395 + 98
= -297 kJ

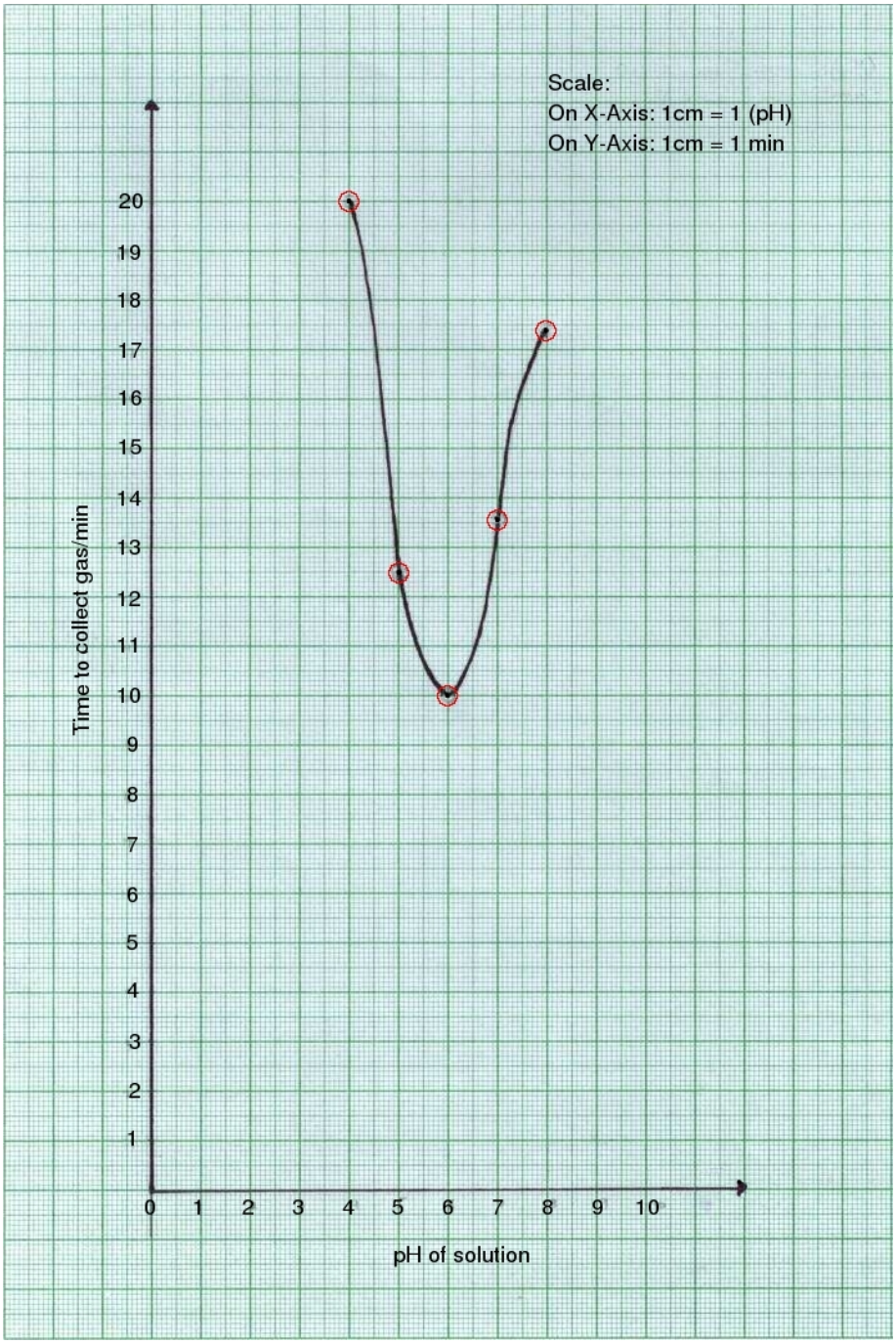
68. 1. pH = 5.5

2. a) Activity curve A – Pepsin (2.00)
b) **Omitted**

3. The active site of the enzyme is being destroyed. The ionisable groups of the enzyme, especially those of the active site, are being modified. Hence the substrate no longer fits easily into the active site and catalytic activity is diminished.

4.

pH of solution	Time to collect gas/min
4	20
5	12.5
6	10
7	13.6
8	17.4



5. pH = 6.00

6. From pH 4 to 6, ionisable groups of the active site becomes more efficient at receiving and complexing with the substrate. The reverse is true when pH changes from 6 to 8.