



IB Chemistry – SL

Topic 9 Answers

1. D [1]
2. B [1]
3. D [1]
4. D [1]
5. D [1]
6. D [1]
7. D [1]
8. D [1]
9. B [1]
10. D [1]
11. B [1]
12. A [1]
13. A [1]
14. A [1]
15. B [1]
16. B [1]
17. A [1]
18. B [1]
19. A [1]
20. B [1]



[1]

21. D

[1]

22. C

[1]

23. B

[1]

24. D

[1]

25. C

[1]

26. A

[1]

27. A

[1]

28. B

[1]

29. D

[1]

30. A

[1]

31. A

[1]

32. A

[1]

33. C

[1]

34. B

[1]

35. D

[1]

36. (a) *oxidizing agent:* (acidified) potassium permanganate(VII)/(H⁺) and MnO₄⁻
and reducing agent: Sn²⁺;
Both oxidizing agent and reducing agent required for [1].

1



- (b) $5\text{Sn}^{2+} + 2\text{MnO}_4^- + 16\text{H}^+ \rightarrow 5\text{Sn}^{4+} + 2\text{Mn}^{2+} + 8\text{H}_2\text{O}$; 1 [2]
37. (i) Fe reactant +2 AND Fe product +3 AND Mn product +2;
Mn reactant +7; 2
Do not accept Roman numerals.
- (ii) Fe^{2+} /iron(ii) ions/ferrous ions; 1
Do not accept "iron".
- (iii) CH_3OH oxidation state -2 ;
 CH_2O oxidation state 0;
(change is) oxidation/dehydrogenation; 3 [6]
38. (i) silver nitrate; 1
- (ii) oxidation;
 $\text{Cu} \rightarrow \text{Cu}^{2+} + 2\text{e}^-$; 2
- (iii) (silver nitrate) solution turns blue/grey or black or silver solid forms;
copper ions form/ Cu^{2+} ions form/silver deposited; 2 [5]
39. (i) sodium chloride crystals consist of ions in a rigid lattice/ions can not
move about;
when melted the ions are free to move or ions move when a voltage
is applied;
in electrolysis positive sodium ions or Na^+ ions move to the negative
electrode or cathode; and negative chloride ions or Cl^- move to the
positive electrode or anode; 4
- (ii) sodium formed at cathode or negative electrode;
 $\text{Na}^+ + \text{e}^- \rightarrow \text{Na}$;
chlorine formed at anode or positive electrode; 4
 $2\text{Cl}^- \rightarrow \text{Cl}_2 + 2\text{e}^-$;
1st and 3rd marks can be scored in (i).
- (iii) manufacture of sodium and chlorine/one stated use of chlorine
or sodium; 1 [9]
40. *at negative electrode (cathode)*
 $\text{Na}^+ + \text{e}^- \rightarrow \text{Na}$;
at positive electrode (anode)
 $2\text{Cl}^- \rightarrow \text{Cl}_2 + 2\text{e}^-$;
*If both equations correct but electrodes incorrect or not stated,
then deduct [1].*



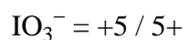
- electrons flow through the external circuit or wires;
ions gain/lose electrons at electrodes/ions move to electrodes. 4 [4]
41. (i) chlorine/ Cl_2 gains electrons and is reduced;
bromide (ions)/ Br^- loses electrons and is oxidized; 2
Award [1] max if no mention of reduced and oxidized.
- (ii) S in SO_2
+4;
S in H_2SO_4
+6;
Award only [1] for 4 + and 6 + or 4 and 6.
- SO_2 oxidized because oxidation number (of sulfur) increases; 3 [5]
42. (i) loss of electrons; 1
(ii) (a species that) gains electrons (from another species)/causes electron loss; 1 [2]
43. changes by 3;
reduced because its oxidation number decreased / $+6 \rightarrow +3$ / $6+ \rightarrow 3+$ / it has gained electrons; [2]
44. (i) (a species that) gains electrons (from another species)/causes electron loss; 1
(ii) changes by 3;
reduced because its oxidation number decreased / $+6 \rightarrow +3$ / $6+ \rightarrow 3+$ /
it has gained electrons; 2 [3]
45. (i) $\text{C}_6\text{H}_8\text{O}_6 \rightarrow \text{C}_6\text{H}_6\text{O}_6 + 2\text{H}^+ + 2\text{e}^-$; 1
(ii) $\text{C}_6\text{H}_8\text{O}_6 + 2\text{Fe}^{3+} \rightarrow \text{C}_6\text{H}_6\text{O}_6 + 2\text{H}^+ + 2\text{Fe}^{2+}$; 1 [2]
46. (i) (diagram showing)
container, liquid, electrodes and power supply;
bromine formed at + electrode;
potassium formed at – electrode; 3
*Award [1] for both correct products shown at wrong electrodes,
or if no polarity indicated.*
- (ii) electrons flow through connecting wires;
ions move (through liquid) to electrodes (and lose/gain electrons); 2



No need to indicate polarity of electrodes.

Accept e instead of e^- .

[7]



2

Award [2] for all three correct, [1] for any two correct,

Signs must be included

Do not accept Roman numerals

(ii) *oxidation*

I^- (to I_2), increase in oxidation number/loss of electron(s);

reduction

IO_3^- (to I_2), decrease in oxidation number/gain of electron(s);

2

[4]