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]

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 MnO_4^- and *reducing agent*: Sn^{2+}; 1

*Both oxidizing agent and reducing agent required for **[1]**.*

(b) $\underline{5}Sn^{2+} + \underline{2}MnO_4^- + \underline{16}H^+ \rightarrow \underline{5}Sn^{4+} + \underline{2}Mn^{2+} + \underline{8}H_2O$; 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;
$Cu \rightarrow Cu^{2+} + 2e$; 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;
$Na^+ + e \rightarrow Na$;
chlorine formed at anode or positive electrode; 4
$2Cl^- \rightarrow Cl_2 + 2e$;
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)*

$Na^+ + e^- \rightarrow Na$;

at positive electrode (anode)

$2Cl^- \rightarrow Cl_2 + 2e^-$;
*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 → +3 / 6+ → 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 → +3 / 6+ → 3+ /
it has gained electrons; 2

[3]

45. (i) $C_6H_8O_6 \rightarrow C_6H_6O_6 + 2H^+ + 2e$; 1

(ii) $C_6H_8O_6 + 2Fe^{3+} \rightarrow C_6H_6O + 2H^+ + 2Fe^{2+}$; 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

(iii) $K^+ + e^- \rightarrow K$;

$2Br^- \rightarrow Br_2 + 2e^-$; 2

No need to indicate polarity of electrodes.

Accept e instead of e^-.

[7]

47. (i) I– = –1 / 1–

IO_3^- = +5 / 5+

I_2 = 0 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]