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(3)
(Total 4 marks)

IB Chemistry – HL

Topic 2 Answers

1. D

[1]

2. D

[1]

3. C

[1]

4. C

[1]

5. D

[1]

6. C

[1]

7. D

[1]

8. D

[1]

9. (i) $1s^2 2s^2 2p^6 3s^2 3p^6$; 1

Do not accept [Ne] $3s^2 3p^6$ *or* 2, 8, 8.

(ii) $K^+ / Ca^{2+} / Sc^{3+} / Ti^{4+}$;
$Cl^- / S^{2-} / P^{3-}$; 2

Accept other suitable pairs of ions.

[3]

10. (a) $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 4s^2\ 3d^{10}\ 4p^2$/[Ar] $4s^2\ 3d^{10}\ 4p^2$; 1

Do not penalize for interchanging $4s^2$ and $3d^{10}$.

(b) (i) (4)p; 1

(ii) $Ge^+(g) \rightarrow Ge^{2+}(g) + e^-$; 1

Do not penalize for $e^-(g)$.

Accept loss of electron on LHS.

(iii) 5th electron removed from energy level closer to nucleus/5th electron removed from 3rd energy level and 4th electron from 4th energy level/*OWTTE*;
attraction by nucleus or protons greater (for electrons closer to nucleus)/*OWTTE*; 2

[5]

11. (i) same nuclear charge, fewer electrons (thus more energy required to remove successive electrons)/harder to remove an electron from an ion with increasing positive charge/nucleus has greater effect on smaller number of electrons/*OWTTE*; 1

(ii) large increases in IE when 2nd **and** 10th electron removed; thus, 1st electron further from nucleus than 2nd electron; and 9th electron further from nucleus than 10th electron; large increases indicate changes in main energy levels/*OWTTE*;

OR

outermost/3p electron has low IE because it is far/furthest from the nucleus; electron(s) in second shell/2p electrons are much closer (to nucleus) **and** need much more energy to remove/IE much higher/very high/there is a big jump in IE;

electron(s) in first/innermost shell/1s electrons are even closer (to nucleus) and need much more energy to remove (than those in second shell/2s or 2p electrons); 3

[4]