

Classification of Elements and Periodicity in Properties — NEET Chemistry PYQ (2005-2021)

Class 11 Chemistry · 16 real NEET & AIPMT questions, year-tagged · answers checked by RankUp

NEET 2021

1. From the following pairs of ions which one is not an iso-electronic pair ?

- (A) O^{2-} , F^{-}
- (B) Na^{+} , Mg^{2+}
- (C) Mn^{2+} , Fe^{3+}
- (D) Fe^{2+} , Mn^{2+}

NEET 2020 · Q96

2. Identify the incorrect match. Name — IUPAC Official Name: (a) Unnilunium — (i) Mendelevium; (b) Unniltrium — (ii) Lawrencium; (c) Unnilhexium — (iii) Seaborgium; (d) Unununnium — (iv) Darmstadtium

- (A) (a), (i)
- (B) (b), (ii)
- (C) (c), (iii)
- (D) (d), (iv)

NEET 2020 · Q131

3. Match the following : Oxide — Nature: (a) CO — (i) Basic; (b) BaO — (ii) Neutral; (c) Al_2O_3 — (iii) Acidic; (d) Cl_2O_7 — (iv) Amphoteric. Which of the following is correct option ?

- (A) (a)-(i), (b)-(ii), (c)-(iii), (d)-(iv)
- (B) (a)-(ii), (b)-(i), (c)-(iv), (d)-(iii)
- (C) (a)-(iii), (b)-(iv), (c)-(i), (d)-(ii)
- (D) (a)-(iv), (b)-(iii), (c)-(ii), (d)-(i)

NEET 2019 · Q60

4. For the second period elements the correct increasing order of first ionisation enthalpy is:

- (A) $Li < Be < B < C < N < O < F < Ne$
- (B) $Li < B < Be < C < O < N < F < Ne$
- (C) $Li < B < Be < C < N < O < F < Ne$
- (D) $Li < Be < B < C < O < N < F < Ne$

NEET 2018 · Q58

5. Which of the following oxides is most acidic in nature?

- (A) BaO
- (B) BeO
- (C) MgO
- (D) CaO

NEET 2017 · Q28

6. The element Z = 114 has been discovered recently. It will belong to which of the following family/group and electronic configuration?

- (A) Halogen family, $[Rn] 5f^{14} 6d^{10} 7s^2 7p^5$
- (B) Carbon family, $[Rn] 5f^{14} 6d^{10} 7s^2 7p^2$
- (C) Oxygen family, $[Rn] 5f^{14} 6d^{10} 7s^2 7p^4$
- (D) Nitrogen family, $[Rn] 5f^{14} 6d^{10} 7s^2 7p^6$

AIPMT 2015

7. The species Ar, K^+ and Ca^{2+} contain the same number of electrons. In which order do their radii increase?

- (A) $K^+ < Ar < Ca^{2+}$
- (B) $Ar < K^+ < Ca^{2+}$
- (C) $Ca^{2+} < Ar < K^+$
- (D) $Ca^{2+} < K^+ < Ar$

AIPMT 2012 Prelims

8. Identify the wrong statement in the following:

- (A) Atomic radius of the elements decreases as one moves across from left to right in the 2nd period of the periodic table
- (B) Amongst isoelectronic species, smaller the positive charge on the cation, smaller is the ionic radius
- (C) Amongst isoelectronic species, greater the negative charge on the anion, larger is the ionic radius
- (D) Atomic radius of the elements increases as one moves down the first group of the periodic table

AIPMT 2011 Mains

9. What is the value of electron gain enthalpy of Na^+ if IE_1 of Na = 5.1 eV?

- (A) +2.55 eV
- (B) +10.2 eV
- (C) -5.1 eV
- (D) -10.2 eV

AIPMT 2010 Mains · Q91

10. Among the elements Ca, Mg, P and Cl, the order of increasing atomic radii is

- (A) $Mg < Ca < Cl < P$
- (B) $Cl < P < Mg < Ca$
- (C) $P < Cl < Ca < Mg$
- (D) $Ca < Mg < P < Cl$

AIPMT 2010 Mains · Q97

11. Among the following which one has the highest cation to anion size ratio?

- (A) CsI
- (B) CsF
- (C) LiF
- (D) NaF

AIPMT 2010 Prelims · Q72

12. The correct order of the decreasing ionic radii among the following isoelectronic species is

- (A) $K^+ > Ca^{2+} > Cl^- > S^{2-}$
- (B) $Ca^{2+} > K^+ > S^{2-} > Cl^-$
- (C) $Cl^- > S^{2-} > Ca^{2+} > K^+$
- (D) $S^{2-} > Cl^- > K^+ > Ca^{2+}$

AIPMT 2010 Prelims · Q79

13. Which of the following represents the correct order of increasing electron gain enthalpy with negative sign for the elements O, S, F and Cl?

- (A) $S < O < Cl < F$
- (B) $Cl < F < O < S$
- (C) $O < S < F < Cl$
- (D) $F < S < O < Cl$

14. Amongst the elements with following electronic configurations, which one of them may have the highest ionization energy?

- (A) [Ne] $3s^2 3p^2$
- (B) [Ar] $3d^{10} 4s^2 4p^3$
- (C) [Ne] $3s^2 3p^1$
- (D) [Ne] $3s^2 3p^3$

15. A nuclide of an alkaline earth metal undergoes radioactive decay by emission of three α -particles in succession. The group of the periodic table to which the resulting daughter element would belong is :

- (A) Group 14
- (B) Group 16
- (C) Group 4
- (D) Group 6

16. Which one of the following arrangements represents the correct order of electron gain enthalpy (with negative sign) of the given atomic species ?

- (A) $\text{Cl} < \text{F} < \text{S} < \text{O}$
- (B) $\text{O} < \text{S} < \text{F} < \text{Cl}$
- (C) $\text{S} < \text{O} < \text{Cl} < \text{F}$
- (D) $\text{F} < \text{Cl} < \text{O} < \text{S}$

Answer key and explanations

1. Answer: (D) Fe^{2+} , Mn^{2+}

Fe^{2+} has $26 - 2 = 24$ electrons, Mn^{2+} has $25 - 2 = 23$, so they are not isoelectronic. O^{2-}/F^- and $\text{Na}^+/\text{Mg}^{2+}$ each have 10 electrons, and $\text{Mn}^{2+}/\text{Fe}^{3+}$ each have 23.

2. Answer: (D) (d), (iv)

Unununnium is element 111, which is roentgenium; darmstadtium is element 110 (ununnilium). Unnilunium (101) is mendelevium, unniltrium (103) is lawrencium and unnilhexium (106) is seaborgium, so those pairs are correct.

3. Answer: (B) (a)-(ii), (b)-(i), (c)-(iv), (d)-(iii)

CO is a neutral oxide, BaO (from an alkaline earth metal) is basic, Al_2O_3 reacts with both acids and bases so it is amphoteric, and Cl_2O_7 is the anhydride of HClO_4 and strongly acidic. This follows the trend from basic metal oxides to acidic non-metal oxides.

4. Answer: (B) $\text{Li} < \text{B} < \text{Be} < \text{C} < \text{O} < \text{N} < \text{F} < \text{Ne}$

IE generally rises across the period, but $\text{B} < \text{Be}$ (Be has a filled $2s$, B 's $2p$ electron is easier to remove) and $\text{O} < \text{N}$ (N has a stable half-filled $2p^3$; O 's paired electron is repelled). Hence $\text{Li} < \text{B} < \text{Be} < \text{C} < \text{O} < \text{N} < \text{F} < \text{Ne}$.

5. Answer: (B) BeO

Down group 2 metallic character increases, so the oxides become more basic: $\text{BeO} < \text{MgO} < \text{CaO} < \text{BaO}$ in basicity. BeO is amphoteric and thus the most acidic; BaO is the most basic.

6. Answer: (B) Carbon family, $[\text{Rn}] 5f^{14} 6d^{10} 7s^2 7p^2$

After radon ($Z = 86$), 32 more electrons fill $7s^2 5f^{14} 6d^{10} 7p^2$, reaching $Z = 86 + 2 + 14 + 10 + 2 = 114$. A p^2 valence configuration places it in group 14, the carbon family (flerovium).

7. Answer: (D) $\text{Ca}^{2+} < \text{K}^+ < \text{Ar}$

All three have 18 electrons; the greater the nuclear charge ($\text{Ca } 20 > \text{K } 19 > \text{Ar } 18$), the more strongly the electrons are pulled in. So the radii increase $\text{Ca}^{2+} < \text{K}^+ < \text{Ar}$.

8. Answer: (B) Amongst isoelectronic species, smaller the positive charge on the cation, smaller is the ionic radius

In an isoelectronic series, a larger positive charge pulls the same number of electrons more strongly and gives a smaller radius; so a smaller positive charge gives a larger, not smaller, radius. The other statements are correct: radius decreases across a period, increases down a group, and increases with greater negative charge.

9. Answer: (C) -5.1 eV

$\text{Na}^+ + \text{e}^- \rightarrow \text{Na}$ is exactly the reverse of $\text{Na} \rightarrow \text{Na}^+ + \text{e}^-$ ($\text{IE}_1 = 5.1 \text{ eV}$), so energy is released and $\Delta_{\text{egH}} = -5.1 \text{ eV}$. $+2.55 \text{ eV}$ or $\pm 10.2 \text{ eV}$ come from wrongly halving or doubling the ionisation energy.

10. Answer: (B) $\text{Cl} < \text{P} < \text{Mg} < \text{Ca}$

Across period 3 radius decreases ($\text{Mg} > \text{P} > \text{Cl}$), and down group 2 it increases ($\text{Ca} > \text{Mg}$). So the increasing order is $\text{Cl} < \text{P} < \text{Mg} < \text{Ca}$. Orders starting with Ca or Mg reverse the periodic trend.

11. Answer: (B) CsF

The ratio is largest when the cation is largest and the anion smallest: Cs^+ is the biggest cation and F^- the smallest anion, so CsF (about $167/133 \approx 1.26$). CsI has a big cation but a much bigger anion, and LiF has the smallest cation.

12. Answer: (D) $\text{S}^{2-} > \text{Cl}^- > \text{K}^+ > \text{Ca}^{2+}$

All four ions have 18 electrons. Size falls as nuclear charge rises: S^{2-} ($Z = 16$) $>$ Cl^- (17) $>$ K^+ (19) $>$ Ca^{2+} (20). The orders putting cations first reverse this trend.

13. Answer: (C) $\text{O} < \text{S} < \text{F} < \text{Cl}$

Negative electron gain enthalpies: $\text{O} \approx 141$, $\text{S} \approx 200$, $\text{F} \approx 328$, $\text{Cl} \approx 349 \text{ kJ/mol}$. O and F are less negative than S and Cl because their small size causes electron repulsion. So $\text{O} < \text{S} < \text{F} < \text{Cl}$.

14. Answer: (D) $[\text{Ne}] 3\text{s}^2 3\text{p}^3$

$[\text{Ne}]3\text{s}^2 3\text{p}^3$ is phosphorus: a small period-3 atom with a stable half-filled 3p subshell, so it has the highest ionization energy here. $[\text{Ar}]3\text{d}^{10} 4\text{s}^2 4\text{p}^3$ (arsenic) is also half-filled but larger, and the 3p^1 and 3p^2 atoms (Al, Si) lose electrons more easily.

15. Answer: (A) Group 14

Each α -emission lowers Z by 2, so three α -particles lower Z by 6, i.e. six places back in the periodic table. From group 2 this goes to group 14 of the previous period (e.g. Ra , $Z = 88 \rightarrow \text{Pb}$, $Z = 82$).

16. Answer: (B) $\text{O} < \text{S} < \text{F} < \text{Cl}$

Cl has the most negative electron gain enthalpy. F and O are less negative than Cl and S because their small size causes strong electron-electron repulsion; also halogens exceed chalcogens. So $\text{O} < \text{S} < \text{F} < \text{Cl}$.

Questions as set in the AIPMT/NEET papers conducted by CBSE and NTA. Answers checked and explanations written by the RankUp team. RankUp is not affiliated with CBSE or NTA.