

Practice exam questions for Chapter 5: Atoms (Write-on version)

Question 1 (Bursary 2000 Question 2)

Vanadium is a transition metal.

a Complete the electron configuration of vanadium. A [Ar]_____

b What is the highest possible oxidation state for vanadium? A _____

Justify your answer. M

c Explain why vanadium exists in the +2 oxidation state in some compounds? M

d In acidic solution V_2O_5 forms the yellow VO_2^+ ion. The VO_2^+ ion can be reduced by zinc in the presence of (concentrated) hydrochloric acid to the violet $[V(H_2O)_6]^{2+}$ ion.

Give TWO characteristics of transition metal compounds that are illustrated in the above description.

A M

Characteristic 1: _____

Characteristic 2: _____

Question 2 (Bursary 2000 Question 11)

a For each of the following pairs, circle the species that has the larger radius. A

Justify your answers in terms of atomic structure. M

i S S^{2-}

ii O^{2-} S^{2-}

b For the following pair, circle the species that has the larger ionisation energy. **A**

S

Cl

Justify your answer in terms of atomic structure. **M**

Question 3 (Bursary 2001 Question 1)

a Write the **symbol** of an element from the first 36 elements of the periodic table that matches each description below. (There may be more than one correct answer but only one is required.) **A M**

Choose an element that is:

i in row 3 of the periodic table and forms an acidic oxide _____

ii a non-metal and a liquid at 25 °C _____

iii able to exist in the +7 oxidation state _____

iv a transition metal with only one electron in the 4s orbital _____

v the most electronegative element _____

vi able to form an oxyanion XO_4^{3-} . _____

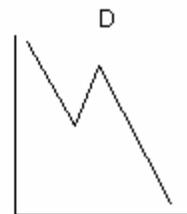
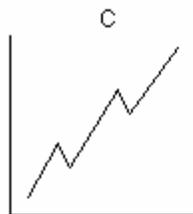
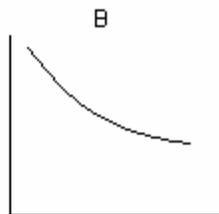
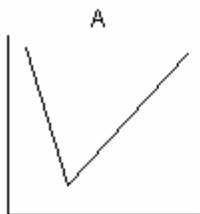
b Write *s*, *p*, *d* electron configurations for: **A M**

i P _____

ii Zn^{2+} _____

c i Write the equation for the reaction for which the energy change is the first ionisation energy of magnesium. **A M**

ii Is this reaction endothermic or exothermic? **A** _____

d

i Circle the letter of the graph that represents the general trend in ionisation energy from Na to Ar.

A**B****C****D****A**

ii Circle the letter of the graph that represents the general trend in atomic radius from Na to Ar.

A**B****C****D****A**

iii Justify your answer to **ii** above in terms of atomic structure. **A M**

e Explain why transition metals:

i often form coloured compounds **A M**

ii have many oxidation states **A**
