

Mark schemes

Q1.

- (a) (atoms of) argon have a stable arrangement of electrons
allow (atoms of) argon have a full outer shell (of electrons) 1
- (so) argon (atoms) do not share / transfer electrons 1
- (b) PH_3
allow H_3P 1
- (c) yes, because tellurium is towards the right of the periodic table
allow yes, because tellurium is in Group 6 1
- (so) tellurium is a non-metal
allow (so) tellurium will gain electrons (from a metal) 1
- MP2 is dependent upon MP1 being awarded*

OR

- yes, because tellurium is in the same group as oxygen / sulfur (1)
- (and) oxygen / sulfur will react with metals (1)
allow (so) tellurium is a non-metal
allow (so) tellurium will gain electrons (from a metal)

OR

- no, because tellurium is towards the bottom of the periodic table (1)
- (so) tellurium is a metal (1)
allow (so) difficult for tellurium to gain electrons (from a metal) (1)

OR

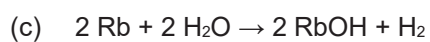
- cannot predict as tellurium is towards the bottom and to the right of the periodic table (1)
- (so) don't know whether tellurium is a metal or non-metal (1)
allow (so) don't know whether tellurium will gain electrons

- (d) any **two** from:
- effervescence / fizzing / bubbles
ignore produces a gas
 - barium disappears
allow barium gets smaller
 - forms a colourless solution
 - temperature increases
allow barium moves around
- 2
- ignore references to floating / flames*
- (e) $\text{Ba} + 2 \text{HCl} \rightarrow \text{BaCl}_2 + \text{H}_2$
allow multiples
- 3
- allow 1 mark for BaCl_2*
allow 1 mark for H_2
ignore state symbols

[10]

Q2.

- (a) any **one** from:
- more vigorous bubbling (for rubidium)
 - bigger / brighter flame (for rubidium)
allow converse statements for potassium
allow (rubidium) catches fire more quickly
allow (rubidium) moves around more quickly
allow (rubidium) explodes
allow (rubidium) disappears more quickly
allow (rubidium) melts more quickly
- 1
- (b) (rubidium's) outer shell / electron is further from the nucleus
allow the (rubidium) atom is larger
allow (rubidium) has more shells
- 1
- (so) there is less (electrostatic) attraction between the nucleus and the outer electron (in rubidium)
allow (so) there is more shielding between the outer electron and the nucleus (in rubidium)
- 1
- (so) the outer electron (in rubidium) is more easily lost
allow (so) less energy is needed to remove the (outer) electron (in rubidium)
- 1
- allow energy level for shell throughout*
allow converse argument in terms of potassium



ignore state symbols

allow multiples

allow 1 mark for H_2

allow 1 mark for RbOH

3

(d) the noble gases have boiling points that increase going down the group

1

(e) (relative atomic mass =) $\frac{(90.48 \times 20) + (0.27 \times 21) + (9.25 \times 22)}{100}$

allow (relative atomic mass =) $\frac{1809.6 + 5.67 + 203.5}{100}$

allow (relative atomic mass =) $18.096 + 0.0567 + 2.035$

1

$= 20.1877$

1

$= 20.2$

*allow an answer correctly rounded to 3 significant figures
from an incorrect calculation which uses all of the values in
the table*

ignore units

1

[11]