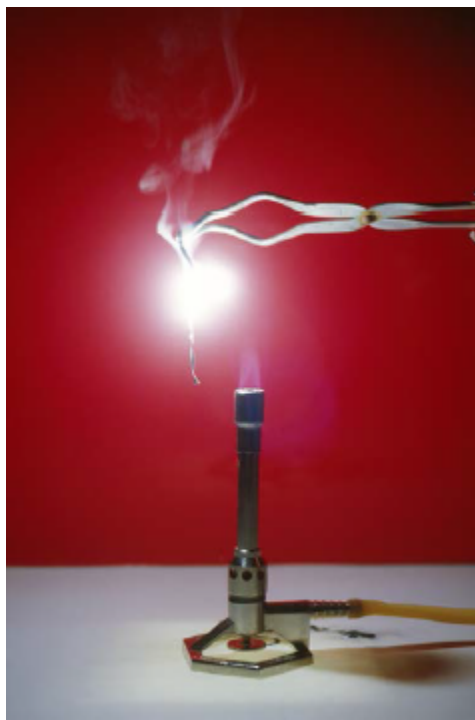


1

The figure below shows magnesium burning in air.



© Charles D Winters/Science Photo Library

(a) Look at the figure above.

How can you tell that a chemical reaction is taking place?

.....
.....

(1)

(b) Name the product from the reaction of magnesium in the figure.

.....

(1)

(c) The magnesium needed heating before it would react.

What conclusion can you draw from this?

Tick **one** box.

The reaction is reversible

The reaction has a high activation energy

The reaction is exothermic

Magnesium has a high melting point

(1)

(d) A sample of the product from the reaction in the figure above was added to water and shaken.

Universal indicator was added.

The universal indicator turned blue.

What is the pH value of the solution?

Tick **one** box.

1

4

7

9

(1)

(e) Why are nanoparticles effective in very small quantities?

Tick **one** box.

They are elements

They are highly reactive

They have a low melting point

They have a high surface area to volume ratio

(1)

(f) Give **one** advantage of using nanoparticles in sun creams.

.....
.....

(1)

(g) Give **one** disadvantage of using nanoparticles in sun creams.

.....
.....

(1)

(h) A coarse particle has a diameter of 1×10^{-6} m.
A nanoparticle has a diameter of 1.6×10^{-9} m.

Calculate how many times bigger the diameter of the coarse particle is than the diameter of the nanoparticle.

.....
.....
.....
.....

(2)
(Total 9 marks)

2

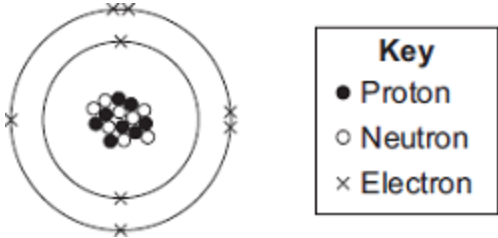
This question is about atoms and molecules.

(a) Complete the table to show the relative masses of the particles in atoms.

Name of particle	Relative mass
Proton
Neutron	1
Electron

(2)

(b) The diagram shows an oxygen atom.



Use the correct number to complete each sentence.

8	16	18	24
----------	-----------	-----------	-----------

The atomic (proton) number of the oxygen atom shown above is

The mass number of the oxygen atom shown above is

(2)

(c) (i) Draw a ring around the correct answer to complete each sentence.

Oxygen atoms with different numbers of neutrons are called

- isotopes.
- molecules.
- polymers.

(1)

(ii) An oxygen atom with a different number of neutrons has 10 neutrons.

Draw a ring around the symbol which represents this atom.



(1)

(d) A water molecule contains hydrogen and oxygen atoms.

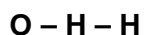
(i) Use the correct answer to complete the sentence.

a compound	an element	a mixture
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Water is

(1)

(ii) Draw a ring around the correct structure of a water molecule.



(1)

(iii) Draw a ring around the type of bonding in a water molecule.

covalent

ionic

metallic

(1)

(iv) Draw a ring around the correct answer to complete each sentence.

The bonds in a water molecule are formed by

gaining

losing

sharing

electrons.

(1)

(Total 10 marks)

3

(a) Balance these chemical equations.



(1)



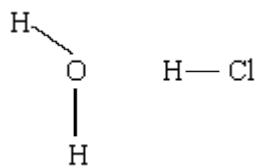
(1)

(b) Briefly explain why an unbalanced chemical equation cannot fully describe a reaction.

.....
.....
.....
.....

(2)

- (c) Explain, as fully as you can, why a water molecule contains two hydrogen atoms but a hydrogen chloride molecule contains only one.



(You may use a diagram in your answer if you wish).

.....

.....

.....

.....

(3)
(Total 7 marks)

Mark schemes

1

(a) any **one** from:

- there was a flame
- energy was given out
- a new substance was formed
- the magnesium turned into a (white) powder

answers must be from the figure

1

(b) Magnesium oxide

1

(c) The reaction has a high activation energy

1

(d) 9

1

(e) They have a high surface area to volume ratio

1

(f) any **one** from:

- Better coverage
- More protection from the Sun's ultraviolet rays

1

(g) any **one** from:

- Potential cell damage to the body
- Harmful effects on the environment

1

(h) indication of $\frac{1}{1.6} = 0.625$

and

use of indices $10^{-9} - 10^{-6} = 10^3$

Both steps must be seen to score first mark

1

$0.625 \times 1000 = 625$ (times bigger)

1

[9]

2

(a) proton 1

ignore \pm

1

electron very small owtte

allow zero

allow values from $1 / 1800$ to $1 / 2000$ or $0.0005 - 0.00055$

1

- (b) 8 1
- 16 1
- (c) (i) Isotopes 1
- (ii) $^{18}_8\text{O}$ 1
- (d) (i) compound 1
- (ii) H-O-H 1
- (iii) covalent 1
- (iv) sharing 1
- [10]**

- 3** (a) (i) $2\text{H}_2 + \text{O}_2 \rightarrow 2\text{H}_2\text{O}$ (allow $\text{H}_2 + \frac{1}{2}\text{O}_2 \rightarrow \text{H}_2\text{O}$)
both circled for 1 mark 1
- (ii) $4\text{Al} + 3\text{O}_2 \rightarrow 2\text{Al}_2\text{O}_3$
all circled for 1 mark 1
- (b) *idea that:*
 must end up with the same number of atoms
 otherwise matter is shown to be lost/gained
 doesn't show correct amount of each element/compared
each for 1 mark 2
- (c) *idea that:*
 oxygen has 2 electrons short in outer shell) in words or
 chlorine has 1 electron short in outer shell) indicated on diagram
 (shared pair/covalent bond with) hydrogen
 atom supplies **one** further electron*
 *(but do not allow hydrogen **gives away** electron or **ionic bond**)
for 1 mark each 3
- [7]**