<u>Questions</u>

Q1.

This question is about the noble gases.
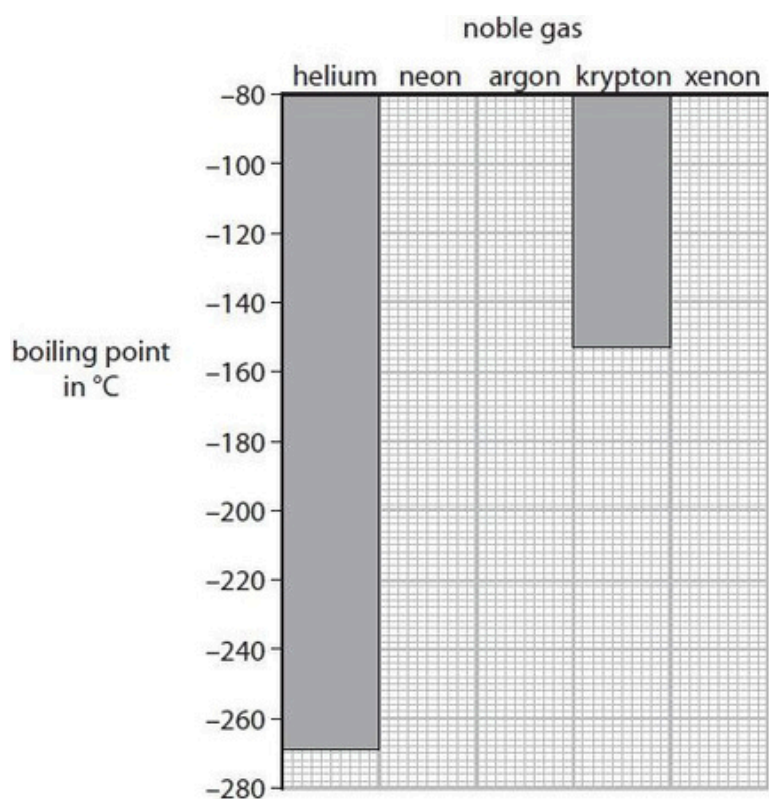
Figure 6 shows the boiling points of some of the noble gases.

noble gas	boiling point in °C
helium	−269
neon	−246
argon	−186
krypton	−153
xenon	

Figure 6

(i) Complete the bar chart to show the boiling points of neon and argon.
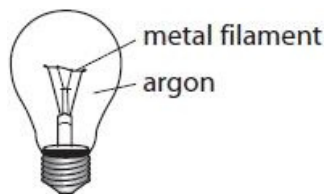
(2)

(ii) Predict the boiling point of xenon.

(1)

boiling point of xenon = ... °C

(Total for question = 3 marks)

Q2.

For many years, argon was used to fill filament light bulbs.

A filament light bulb is shown in Figure 4.

Figure 4

When the bulb is in use the metal filament becomes extremely hot.

Explain why argon, rather than air, was used to fill filament light bulbs.

(2)

....

....

....

....

....

(Total for question = 2 marks)

Q3.

This question is about gases.
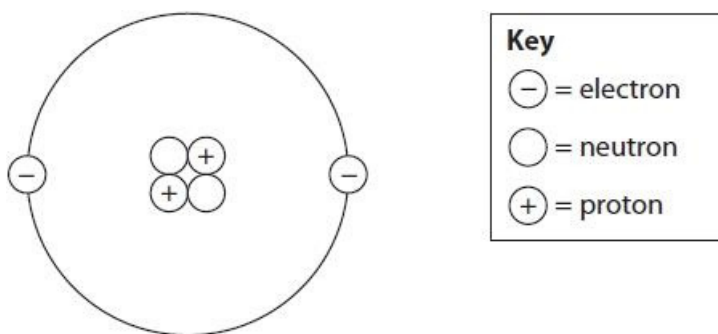
Figure 15

(i) Explain, using Figure 15, why helium is inert.

(2)

....

....

....

(ii) Helium is used to fill balloons.

State one property of helium, apart from it being inert, that makes it suitable for filling balloons.

(1)

....

(Total for question = 3 marks)

Q4.

Four of the noble gases are argon, helium, krypton and neon.

Give these gases in order of increasing density.

(2)

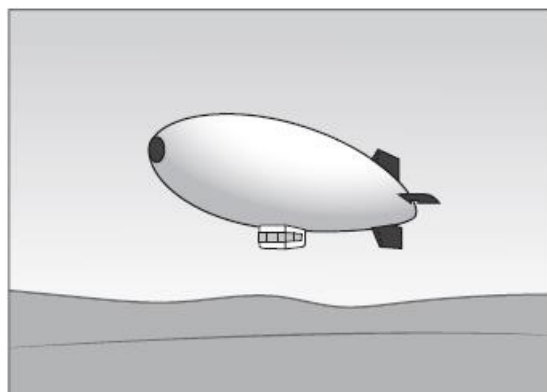...

....

(Total for question = 2 marks)

Q5.

This question is about the noble gases.

(i) State, in terms of outer shell electrons, why the noble gases are unreactive.

(1)

....

(ii) Figure 4 shows an airship, filled with helium, floating above the ground.

Figure 4

Helium, hydrogen and krypton are gases.
Figure 5 shows the reactivity and density, at room temperature and pressure, of helium, hydrogen and krypton.

gas	reactivity	density in g cm^{-3}
helium	unreactive	0.00018
hydrogen	very reactive	0.00009
krypton	unreactive	0.00380

Figure 5

The density of air is 0.001225 g cm–3.
Helium is used in airships.
Explain why hydrogen and why krypton are not used in airships.

(3)

....

....

....

....

(Total for question = 4 marks)

Q6.

The densities of some elements in group 0 are shown in Figure 3.

name	density in g cm^{-3}
helium	0.15
neon	1.2
argon	1.4
krypton	
xenon	3.5

Figure 3

Use the information in Figure 3 to suggest the density of krypton.

(1)

density of krypton = ... g cm−3

(Total for question = 1 mark)

Q7.

The density of a gas can be found using the equation

$$density = \frac{mass}{volume}$$

A student carried out an experiment to find the density of argon.

The mass of a stopper and flask, containing no gas, was known.
The flask was completely filled with argon and its mass measured.
Figure 4 shows the results the student wrote down.

mass of stopper and flask in g	78.639
mass of stopper and flask full of argon in g	79.120
volume of flask in cm³	250.0

Figure 4

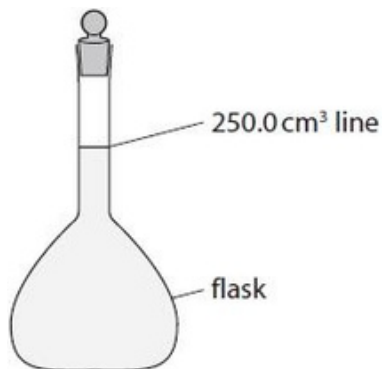(i) Use the results to calculate the density of argon in g cm–3.

(2)

....

....

....

density of argon = ... g cm–3

(ii) The flask used for the experiment is shown in Figure 5.

The flask holds 250.0 cm3 when filled up to the line.

Figure 5

There is an error in the volume the student has used in the calculation.
This would give an incorrect value for the density of argon.
Identify this error and state what should be done to correct it.

(2)

error ....

....

what should be done to correct it ....

....

....

(Total for question = 4 marks)

Mark Scheme

Q1.

Question number	Answer	Additional guidance	Mark
(i)	neon bar correct (1) argon bar correct (1)	if no other mark scored, allow 1 for neon -252 **and** argon -192	(2) AO2

Question number	Answer		Mark
(ii)	allow any value from -152 to -90		(1) AO1

Q2.

Question number	Answer	Additional guidance	Mark
	An explanation linking the points in one of the pairs **EITHER** • argon is {inert / a noble gas} OR **argon** has /atoms have) {full / 8 electrons in} outer shell (1) • so (it) does not react (with metal filament) OR (argon/atoms) do not {gain / lose / share electrons} **OR** • **oxygen** is reactive (1) • (air/oxygen) reacts with metal filament / forms metal oxide (1)	so metal does not burn/ combust (in argon) so (argon) does not {burn / combust} with metal (filament) so (argon) {is unreactive / less reactive / not very reactive / inactive } (with metal filament) ignore air for MP1 here allow metal burns	(2)

Q3.

Question number	Answer	Additional guidance	Mark
(i)	An explanation linking: • it has **two** electrons in outer shell/ it has a **full** outer shell / OWTTE (1) • so does not {gain/ lose/ transfer/ share} **electrons** (1)	MP1 – reject if number of electrons in outer shell is stated and not 2 ignore references to protons and neutrons allow helium has **two** electrons in its (only) shell/helium's (only) shell is full ignore helium does not need to react	(2) AO1 1

Question number	Answer	Additional guidance	Mark
(ii)	less dense than air	allow less dense than nitrogen allow low density / not (very) dense allow diffuses slowly out of balloon ignore less dense than oxygen ignore it is a gas / light / lightweight / inert/ unreactive/ non-flammable / lighter than air / makes balloon float / it rises/ it floats ignore non-toxic / not poisonous	(1) AO2 1

Q4.

Question number	Answer	Additional guidance	Mark
	helium, neon, argon, krypton (2)	krypton, argon, neon, helium (1) if order correct except that two adjacent elements transposed allow 1 allow formulae	(2)

Q5.

Question number	Answer	Mark
(i)	(outer shell is) full/ complete	(1) AO1

Question number	Answer	Additional guidance	Mark
(ii)	An explanation linking • hydrogen is flammable / could ignite (1) • krypton is more dense than air (1) • (so krypton) air ship would not float (1)	allow krypton has a high density	(3) AO3

Q6.

Question number	Answer	Additional guidance	Mark
	accept any number in the range 1.4 – 3.5 accept value either on answer or in the space in the table	Allow any number of decimal places Do not allow number below 1.4 Do not allow negative numbers Do not allow numbers greater than 3.5	(1)

Q7.

Question number	Answer	Additional guidance	Mark
(i)	mass argon = 79.120 – 78.639 (= 0.481 (g)) (1) density = 0.481/250 = 0.001924 (gcm^{-3}) (1)	allow ECF allow 0.002, 0.0019, 0.00192, 0.001924…… for (2)	(2)

Question number	Answer	Additional guidance	Mark
(ii)	An explanation including • the volume of the flask is more than 250 cm^3 / more argon is in the flask than up to the line (1) • measure the whole volume of the flask (e.g. fill with water and measure volume of water) (1)	allow use a flask/ container of known volume	(2)