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5129/02

May/June 2009

2 hours 15 minutes

Candidates answer on the Question Paper.

No Additional Materials are required.

READ THESE INSTRUCTIONS FIRST

Write your Centre number, candidate number and name on all the work you hand in.

Write in dark blue or black pen.

You may use a soft pencil for any diagrams, graphs or rough working.

Do not use staples, paper clips, highlighters, glue or correction fluid.

DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.

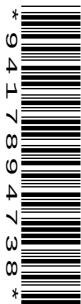
A copy of the Periodic Table is printed on page 24.

At the end of the examination, fasten all your work securely together.

The number of marks is given in brackets [] at the end of each question or part question.

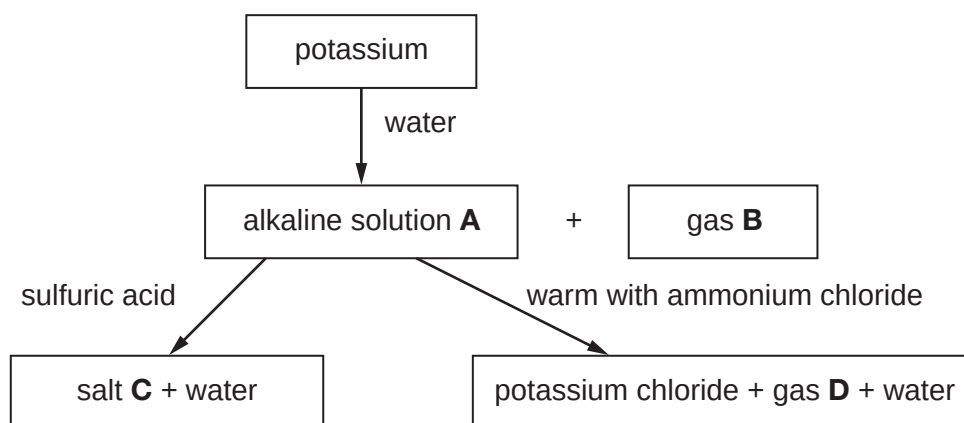
For Examiner's Use

This document consists of **22** printed pages and **2** blank pages.



2

1 Study the following reaction scheme.



(a) Identify substances A, B, C and D.

alkaline solution A

gas B

salt C

gas D

[4]

(b) Name the ion present in solution A that makes it alkaline.

.....[1]

(c) Universal Indicator is added to solution A.
State its final colour.

.....[1]

3

- 2 A stone has a mass of 2.0 kg.
The gravitational field strength, g , on the Earth's surface is 10 N/kg.
- (a) Calculate the weight of the stone on the Earth's surface.

weight = N [1]

- (b) On the Moon, the gravitational field strength is less than on the Earth. The stone is taken to the Moon.
State the change, if any, in

(i) the mass of the stone,

(ii) the weight of the stone.

[2]

4

- 3 An electromagnet and a piece of soft iron are shown in Fig. 3.1.

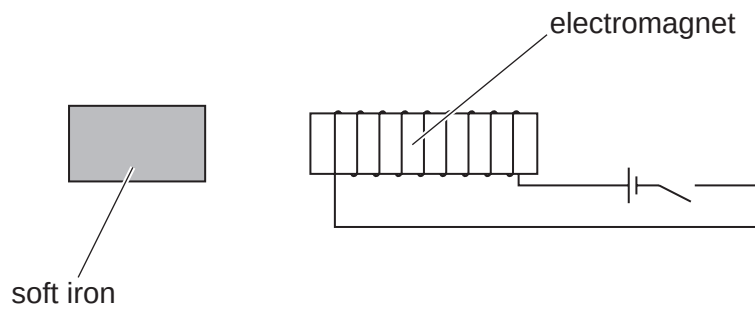


Fig. 3.1

- (a) When the current in the electromagnet is switched on, the soft iron is attracted. The current in the electromagnet is reversed. State the effect, if any, on the attraction of the soft iron.

.....
..... [1]

- (b) Electromagnet cores are usually made of soft iron rather than steel. State the difference between the magnetic properties of soft iron and steel.

.....
..... [2]

4 (a) Define *osmosis*.

.....
.....
.....[2]

(b) How does osmosis result in the uptake of water by plants?

.....
.....[1]

(c) An area of farmland has been flooded with seawater.

Suggest and explain the effect of this flooding on the crops growing on this land.

.....
.....
.....[2]

5 The following is a list of metals.

aluminium

calcium

copper

iron

zinc

(a) From the list, select the metal that

(i) is protected from corrosion by an oxide layer,

.....

[1]

(ii) forms an amphoteric oxide,

.....

[1]

(iii) is a catalyst in the manufacture of ammonia.

.....

[1]

(b) Which metals are mixed together to form brass?

..... and

[2]

- 6 The displacement of particles in wave **X** varies with distance along the wave as shown in Fig. 6.1.

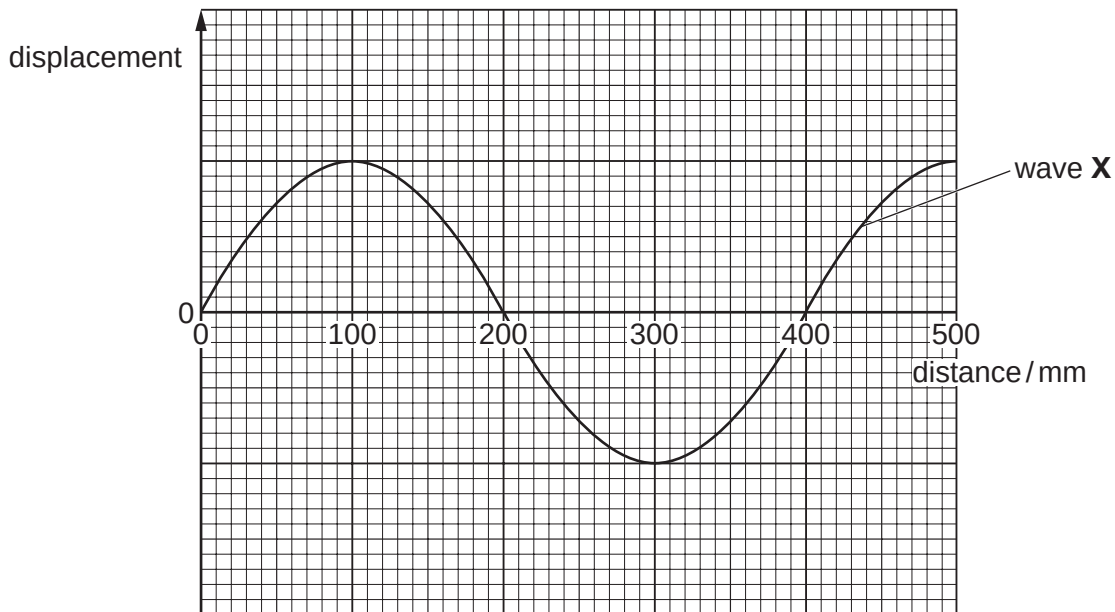


Fig. 6.1

- (a) Use Fig. 6.1 to determine the wavelength of wave **X**. mm [1]
- (b) A second wave, **Y**, has the same wavelength as wave **X** and half the amplitude.
On Fig. 6.1, draw a line to show how the displacement of wave **Y** varies with distance. [1]
- (c) (i) State the unit of frequency.
..... [1]
- (ii) A wave has a speed of 340 m/s and a wavelength of 1.7 m.
Calculate the frequency of this wave.

frequency = [2]

7 Some red blood cells, as seen through a microscope, are shown in Fig. 7.1.

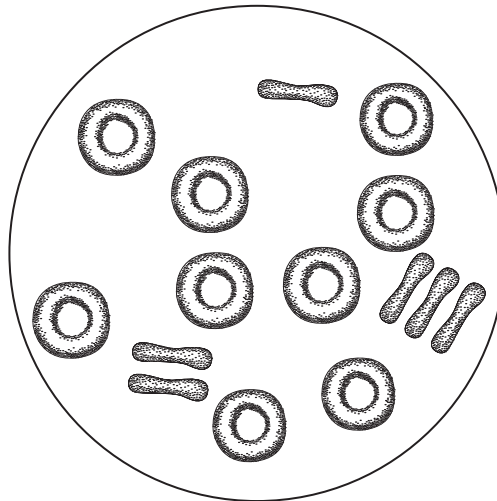


Fig. 7.1

(a) (i) Name **one** structure, normally present in cells, that is **not** present in red blood cells.

.....[1]

(ii) Name two other structures, **not** present in these cells, that would normally be present in **plant cells**.

1.

2.[2]

(b) Blood also contains white blood cells, platelets and plasma.

State one function of

(i) white blood cells,

(ii) platelets,

(iii) plasma.

[3]

- 8 Apparatus used to react magnesium with steam is shown in Fig. 8.1.

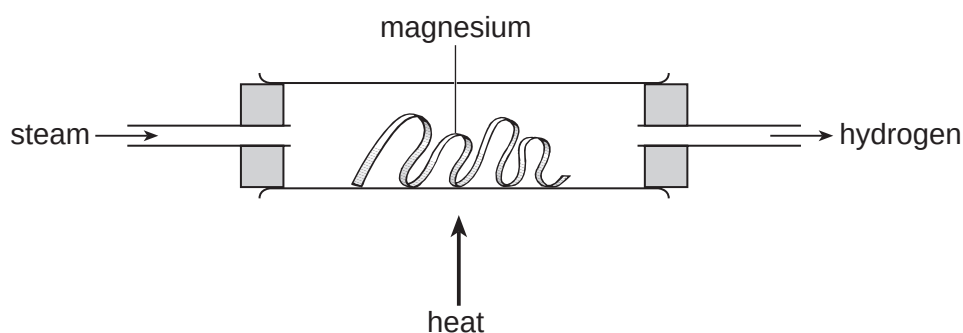
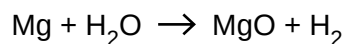


Fig. 8.1

The equation for the reaction is



- (a) What does the reaction tell you about the relative reactivity of magnesium and hydrogen?

.....[1]

- (b) Describe a test to show that the gas produced is hydrogen.

test

result[2]

- (c) State **one** large-scale use of hydrogen.

.....[1]

- (d) (i) Calculate the relative molecular mass of magnesium oxide.
(A_r : Mg, 24; O, 16.)

.....[1]

- (ii) Calculate the mass of magnesium oxide produced when 1.8 g of magnesium is reacted with excess steam.

mass = g [2]

- 9 Fig. 9.1 shows two resistors, **P** and **Q**, in series.

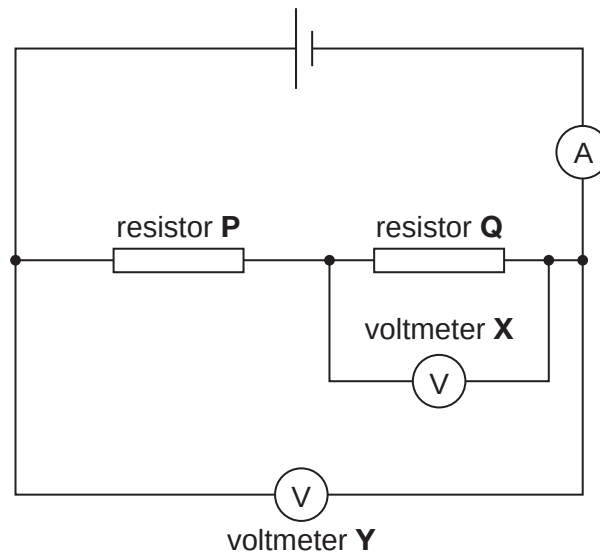


Fig. 9.1

The ammeter reads 0.20 A. Voltmeter **X** reads 1.2 V and voltmeter **Y** reads 2.0 V.

- (a) Calculate the potential difference across resistor **P**.

potential difference = V [1]

- (b) Calculate the resistance of resistor **Q**.

resistance = Ω [2]

- (c) Calculate the charge passing through the ammeter in 2 minutes.

charge = unit [3]

- 10 (a) A balanced diet contains sufficient quantities of protein, carbohydrate, fat, fibre and water.

(i) Name two other different essential components of a balanced diet.

1.

2. [2]

(ii) Explain the importance of fibre in the diet.

.....

..... [1]

(b) Food provides the energy needed by the body.

The energy taken in and used by three people is shown in Fig. 10.1.

	average daily energy intake/kJ	average daily energy used/kJ
Rajiv	9700	9700
Kapilisha	6800	6850
Sanjay	10500	9600

Fig. 10.1

(i) Give a possible reason for the difference in the amounts of energy used by Rajiv and Kapilisha.

.....

..... [1]

(ii) Sanjay continues to eat the same diet for many years.
Suggest a likely effect of this diet on his health.

.....

..... [1]

11 A barrel of gunpowder is shown in Fig. 11.1.

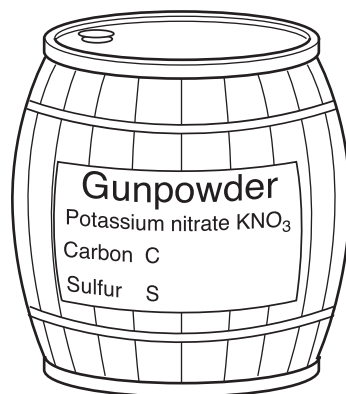


Fig. 11.1

Gunpowder is a mixture of carbon, sulfur and potassium nitrate.
Carbon and sulphur are insoluble in water. Potassium nitrate is soluble in water.

Describe how you would obtain a sample of solid potassium nitrate from the gunpowder.

.....

.....

.....

..... [3]

12 An unmarked liquid-in-glass thermometer is shown in Fig. 12.1.

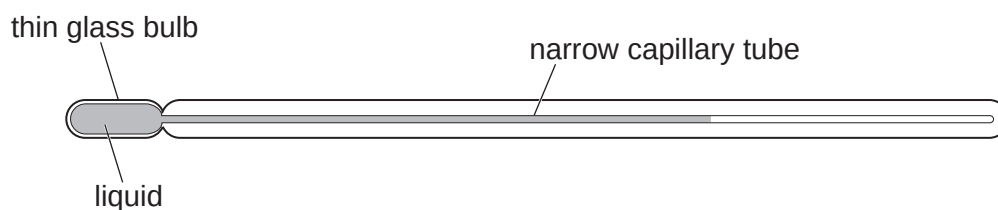
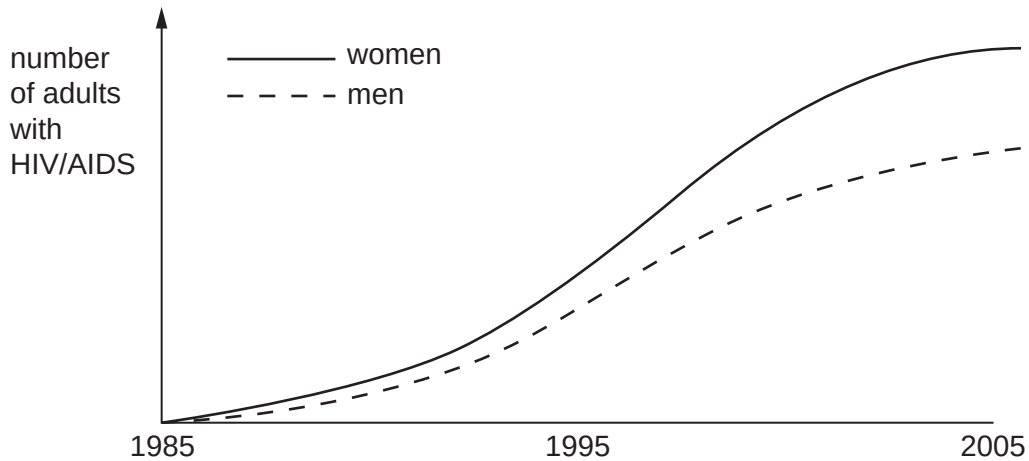


Fig. 12.1

- (a) The thermometer is to have a scale marked on it.
Explain why the thermometer is placed in melting ice and then placed in boiling water.
-
-
- [2]
- (b) State **one** change that could be made to the capillary tube to make a liquid-in-glass thermometer more sensitive.
-
- [1]
- (c) The volume of the liquid in the thermometer changes with change in temperature.
Name **one** physical property of matter, other than volume, that also changes with change in temperature.
- [1]

- 13 The graph shows the number of adults with HIV/AIDS in sub-Saharan Africa between 1985 and 2005.



- (a) State three trends shown by the graph.

1.
.....
2.
.....
3.
..... [3]

- (b) Suggest two ways by which the spread of HIV/AIDS may be reduced.

1.
.....
2.
..... [2]

- (c) State why the abuse of heroin may contribute to the spread of HIV/AIDS.

-
..... [1]

- 14** An atom of fluorine is represented by ${}^{19}_{9}\text{F}$.
The numbers 19 and 9 provide information about the structure of this fluorine atom.

(a) (i) Complete the following sentences.

The number 19 is the number of fluorine.

The number 9 is the number of fluorine. [2]

(ii) Fluorine is a non-metal.
How can this be deduced from the symbol ${}^{19}_{9}\text{F}$?

.....
.....
..... [2]

(iii) Complete Fig. 14.1 to show the electronic structure of fluorine.

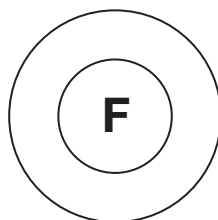


Fig. 14.1

[1]

(b) Fluorine reacts violently with sodium to produce a white substance.

(i) State the name of the substance produced.

.....

(ii) State the type of bonding present in this substance.

.....

[2]

15 Radioactive sources may emit alpha-particles, beta-particles or gamma-rays from their nucleus.

(a) Name apparatus that is used to detect alpha-particles.

.....[1]

(b) State which of alpha-particles, beta-particles or gamma-rays are

(i) the most penetrating,

(ii) the most ionising,

(iii) electrons.

[3]

16 An electric iron is shown in Fig. 16.1.

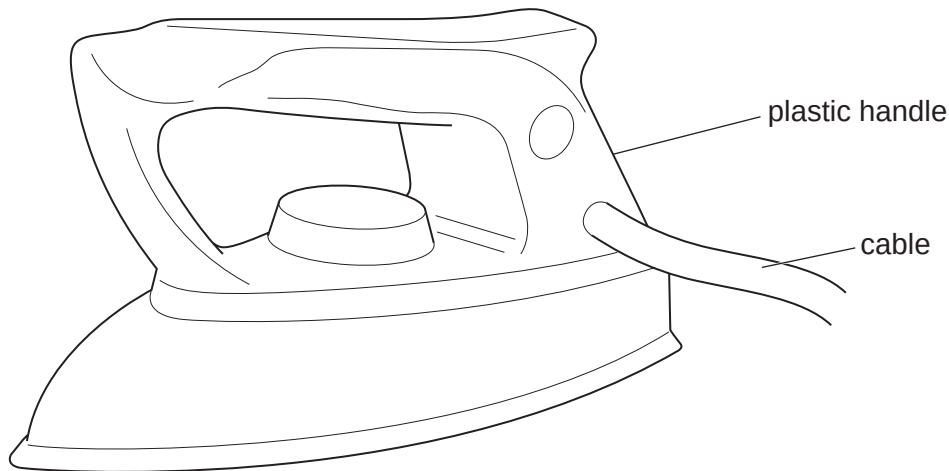


Fig. 16.1

The iron is rated as 2000W.

- (a) Calculate the amount of electrical energy changed into heat energy by the iron in 20 minutes.

energy = unit [3]

- (b) The insulation of the cable may become damaged.
State and explain why this is hazardous.

.....

..... [2]

17 Human activities are destroying the Amazonian rainforest at a rate of about 50 000 km² per year.

(a) Suggest two reasons why rainforests are being destroyed by human activities.

1.
.....
2.
..... [2]

(b) Suggest the possible harmful effects of deforestation on

(i) the Earth's atmosphere,

.....
.....

(ii) animals living in the area,

.....
.....

(iii) the soil.

.....
.....

[3]

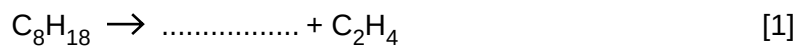
18 Ethene, C_2H_4 , is made by decomposing a long-chain hydrocarbon over a hot catalyst.

(a) (i) Name the process used to decompose this hydrocarbon.

..... [1]

(ii) One of these hydrocarbons is octane.

Complete the equation for the decomposition of octane.



(iii) Draw the structure of ethene.

[1]

(b) Ethanol, C_2H_5OH , is made industrially from ethene.

Name the substance added to ethene to make ethanol.

..... [1]

(c) State **one** use of ethanol. [1]

- 19 A ray of light is incident at an angle of 28° on a water surface as shown in Fig. 19.1.

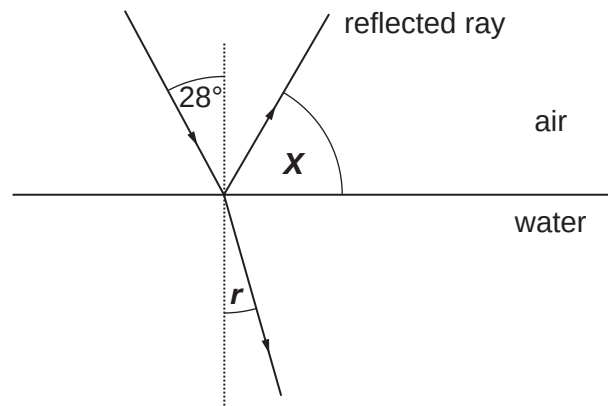


Fig. 19.1

The light is partly reflected and partly refracted.

- (a) Calculate angle X .

$$X = \dots\dots\dots^\circ \quad [1]$$

- (b) The refractive index of the water is 1.33. The angle of incidence is 28° . Calculate the angle of refraction r .

$$\text{angle} = \dots\dots\dots^\circ \quad [3]$$

20 A farmer analyses the nitrogen content of the soil in two of his fields.

The results of this analysis are shown in Fig. 20.1.

	nitrogen content (arbitrary units)
field A	135
field B	30
recommended level	120

Fig. 20.1

(a) Explain why plants need nitrogen.

.....
 [1]

(b) (i) The plants in field **B** do not grow well. In what other way would the appearance of the plants differ from normal?

..... [1]

(ii) How could the nitrogen content of field **B** be increased to the recommended level?

..... [1]

(c) In many parts of the world, not enough food is produced to feed everyone.

(i) Suggest **one** reason why this problem has become worse over the past 100 years.

.....
 [1]

(ii) To feed a large number of people, it is better to grow plant crops, rather than raising animals for meat.

Use ideas about food chains to explain why.

.....
 [2]

DATA SHEET

I

II

III

IV

V

VI

VII

0

Group

7

Li

Lithium

4

23

Na

Sodium

12

39

K

Potassium

20

85

Rb

Rubidium

38

133

Cs

Cesium

56

223

Fr

Francium

88

1

H

Hydrogen

1

3

He

Helium

2

5

B

Boron

6

11

C

Carbon

7

13

Al

Aluminum

14

27

Si

Silicon

15

31

P

Phosphorus

16

55

Mn

Manganese

25

41

Nb

Niobium

42

93

Ta

Tantalum

73

51

V

Vanadium

23

119

In

Indium

50

65

Zn

Zinc

30

135

At

Astatine

85

9

Be

Beryllium

9

25

Mg

Magnesium

12

45

Sc

Scandium

21

105

Db

Dubnium

105

89

Y

Yttrium

39

139

La

Lanthanum

57

137

Ba

Barium

56

226

Ra

Radium

88

127

I

Iodine

53

173

Yb

Ytterbium

70

157

Gd

Gadolinium

64

197

Os

Osmium

76

209

Po

Polonium

84

247

Cm

Curium

96

14

N

Nitrogen

7

28

Si

Silicon

14

32

S

Sulfur

16

64

Cu

Copper

29

59

Ni

Nickel

28

106

Pd

Palladium

46

79

Se

Selenium

34

128

Te

Tellurium

52

83

Bi

Bismuth

83

208

Pb

Lead

82

101

Ru

Ruthenium

44

186

Re

Rhenium

75

159

Tb

Terbium

65

195

Pt

Platinum

78

201

Hg

Mercury

80

247

Bk

Berkelium

97

16

O

Oxygen

8

31

P

Phosphorus

15

48

Ti

Titanium

22

91

Zr

Zirconium

40

103

Rh

Rhodium

45

188

W

Tungsten

74

121

Sn

Stannum

50

171

Lu

Lutetium

71

151

Er

Erbium

68

191

Ir

Iridium

77

209

Po

Polonium

84

247

Cm

Curium

96

19

F

Fluorine

9

35.5

Cl

Chlorine

17

57

La

Lanthanum

57

138

Ce

Cerium

58

87

Fr

Francium

87

223

Ac

Actinium

89

107

Bh

Bohrium

107

163

Yb

Ytterbium

70

155

Eu

Europium

63

193

Os

Osmium

76

208

Pb

Lead

82

247

Cm

Curium

96

20

Ne

Neon

10

36

Ar

Argon

18

36

Kr

Krypton

36

84

Xe

Xenon

54

86

Rn

Radon

86

222

Rn

Radon

86

102

Ni

Nickel

28

108

Pd

Palladium

46

138

Ce

Cerium

58

174

Yb

Ytterbium

70

154

Eu

Europium

63

192

Ir

Iridium

77

207

Pb

Lead

82

247

Cm

Curium

96

103

Lu

Lutetium

71

175

Lu

Lutetium

71

129

Te

Tellurium

52

178

Hf

Hafnium

72

157

Gd

Gadolinium

64

193

Os

Osmium

76

209

Po

Polonium

84

247

Cm

Curium

96

104

Db

Dubnium

104

160

Er

Erbium

68

139

La

Lanthanum

57

175

Lu

Lutetium

71

156

Eu

Europium

63

194

Ir

Iridium

77

208

Pb

Lead

82

247

Cm

Curium

96

105

Db

Dubnium

105

161

Er

Erbium

68

140

Ce

Cerium

58

176

Lu

Lutetium

71

157

Gd

Gadolinium

64

195

Pt

Platinum

78

209

Po

Polonium

84

247

Cm

Curium

96

106

Db

Dubnium

106

162

Er

Erbium

68

141

Pr

Praseodymium

59

177

Lu

Lutetium

71

158

Tb

Terbium

65

196

Pt

Platinum

78

210

Po

Polonium

84

247

Cm

Curium

96

107

Db</

The volume of one mole of any gas is 24dm^3 at room temperature and pressure (r.t.p.).