



Cambridge IGCSE™

CO-ORDINATED SCIENCES

0654/21

Paper 2 Multiple Choice (Extended)

October/November 2020

45 minutes

You must answer on the multiple choice answer sheet.

You will need: Multiple choice answer sheet
Soft clean eraser
Soft pencil (type B or HB is recommended)

INSTRUCTIONS

- There are **forty** questions on this paper. Answer **all** questions.
- For each question there are four possible answers **A, B, C** and **D**. Choose the **one** you consider correct and record your choice in soft pencil on the multiple choice answer sheet.
- Follow the instructions on the multiple choice answer sheet.
- Write in soft pencil.
- Write your name, centre number and candidate number on the multiple choice answer sheet in the spaces provided unless this has been done for you.
- Do **not** use correction fluid.
- Do **not** write on any bar codes.
- You may use a calculator.

INFORMATION

- The total mark for this paper is 40.
- Each correct answer will score one mark. A mark will not be deducted for a wrong answer.
- Any rough working should be done on this question paper.
- The Periodic Table is printed in the question paper.

This document has **16** pages. Blank pages are indicated.



- 1 Which statement is the definition of nutrition?
- A break down of nutrient molecules and the release of energy for metabolism
 - B maintenance of a constant internal environment
 - C removal of the waste products of metabolism
 - D taking in of materials for energy, growth and development
- 2 Which structure in a plant cell makes organic nutrients?
- A cell membrane
 - B cell wall
 - C chloroplast
 - D nucleus
- 3 Nutrient molecules are made up from smaller molecules. Nutrients can be identified by food tests. Which row is true for a protein?

| | smaller molecules | test which gives a positive result |
|----------|-------------------|------------------------------------|
| A | amino acids | Benedict's test |
| B | amino acids | biuret test |
| C | sugars | Benedict's test |
| D | sugars | biuret test |

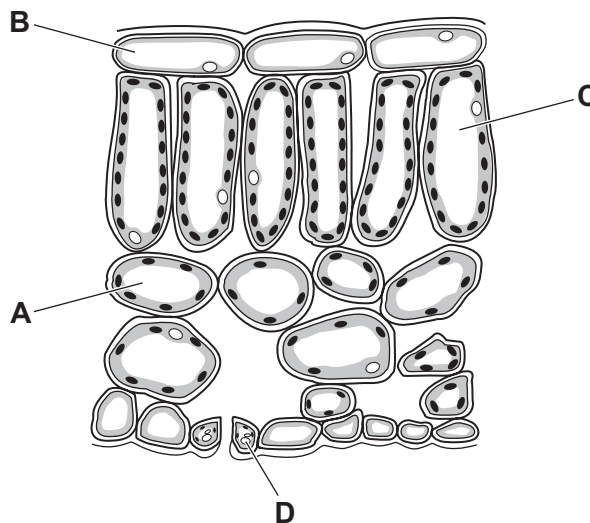
- 4 A mixture of starch and saliva was set up at four different temperatures. Each mixture was tested with iodine solution after 15 minutes and again after 30 minutes.

The results are shown in the table.

| temperature /°C | colour with iodine solution | |
|--------------------|-----------------------------|------------|
| | 15 minutes | 30 minutes |
| 0 | blue-black | blue-black |
| 15 | blue-black | brown |
| 35 | brown | brown |
| 95 | blue-black | blue-black |

What do the results suggest?

- A The enzyme in saliva is inactive at 95 °C.
 B The enzyme in saliva is slow to work at 35 °C.
 C The enzyme in saliva works equally well at 15 °C and 35 °C.
 D The enzyme in saliva works faster at higher temperatures.
- 5 Which cell can control gas exchange?



- 6 Much of the internal surface of the human small intestine is covered with villi.

What is the function of villi?

- A excretion of waste into the intestine
 B secretion of enzymes into the intestine
 C to improve blood circulation in the intestine walls
 D to increase the internal surface area of the intestine

7 Under which conditions will transpiration from a plant be fastest?

| | temperature | humidity |
|----------|-------------|----------|
| A | high | high |
| B | high | low |
| C | low | high |
| D | low | low |

8 What is the word equation for anaerobic respiration in yeast?

- A** glucose → alcohol + carbon dioxide
- B** glucose → carbon dioxide + water
- C** glucose → lactic acid
- D** glucose + oxygen → carbon dioxide + water

9 Which row is correct when looking at a near object?

| | ciliary muscles | suspensory ligaments | lens |
|----------|-----------------|----------------------|------|
| A | contracted | slack | fat |
| B | contracted | tight | thin |
| C | relaxed | slack | thin |
| D | relaxed | tight | fat |

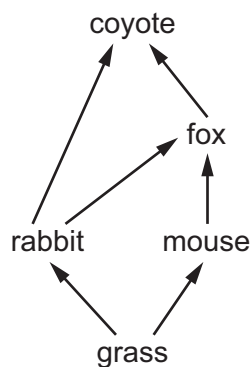
10 In human reproduction, which cells are haploid?

| | gametes | zygotes |
|----------|---------|---------|
| A | ✓ | ✓ |
| B | ✓ | x |
| C | x | ✓ |
| D | x | x |

11 Which term is used to describe an individual with two of the same allele for a characteristic?

- A** genotype
- B** heterozygous
- C** homozygous
- D** phenotype

12 Which organism in the food web is a secondary and a tertiary consumer?



- A coyote
- B fox
- C mouse
- D rabbit

13 During eutrophication, what reduces the concentration of dissolved oxygen in the water?

- A decreased photosynthesis by producers
- B decreased respiration by decomposers
- C increased photosynthesis by producers
- D increased respiration by decomposers

14 A sample of water is contaminated with insoluble chalk and a soluble salt.

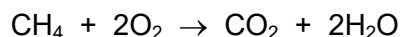
Which two processes are used to separate the water from the chalk and salt?

- A distillation and chromatography
- B distillation and crystallisation
- C filtration and chromatography
- D filtration and crystallisation

15 Which row describes a covalent compound?

| | solubility in water | volatility |
|---|---------------------|------------|
| A | high | low |
| B | high | high |
| C | low | low |
| D | low | high |

16 The equation for the complete combustion of methane is shown.



What is the mass of oxygen that is required for the complete combustion of 16 g of methane?

- A 8g B 16g C 32g D 64g

17 Which statement describes an endothermic reaction?

- A The products have less energy than the reactants and the temperature decreases.
 B The products have less energy than the reactants and the temperature increases.
 C The products have more energy than the reactants and the temperature decreases.
 D The products have more energy than the reactants and the temperature increases.

18 Which row describes how the number of effective collisions and the rate of reaction are affected if the activation energy of a reaction is increased?

| | number of effective collisions | rate of reaction |
|---|--------------------------------|------------------|
| A | higher | greater |
| B | higher | lower |
| C | lower | greater |
| D | lower | lower |

19 Which word equation represents a redox reaction?

- A carbon + copper oxide \rightarrow copper + carbon dioxide
 B hydrochloric acid + potassium hydroxide \rightarrow potassium chloride + water
 C magnesium carbonate \rightarrow magnesium oxide + carbon dioxide
 D sodium sulfate + barium nitrate \rightarrow barium sulfate + sodium nitrate

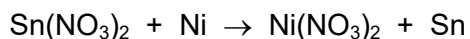
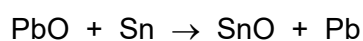
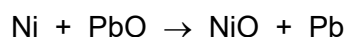
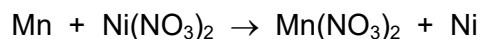
20 Which chemical test does **not** produce a precipitate?

- A carbon dioxide and limewater
 B carbonate ions and dilute hydrochloric acid
 C chloride ions and aqueous silver nitrate
 D copper(II) ions and aqueous sodium hydroxide

21 Which electronic structure is for a non-metallic element?

- A 2 B 2,2 C 2,8,2 D 2,8,8,2

22 The equations for four reactions are shown.



What is the order of reactivity of the metals?

| | most reactive | —————→ | | | least reactive |
|----------|---------------|--------|--------|-----------|----------------|
| A | lead | tin | nickel | manganese | |
| B | manganese | nickel | tin | lead | |
| C | manganese | tin | nickel | lead | |
| D | lead | nickel | tin | manganese | |

23 Which process does **not** produce carbon dioxide?

- A** acid reacting with a metal
- B** acid reacting with sodium carbonate
- C** complete combustion of methane
- D** respiration

24 Which row shows the conditions used in the Haber process?

| | temperature / °C | pressure / atm | catalyst |
|----------|------------------|----------------|----------------|
| A | 150 | 200 | iron |
| B | 150 | 400 | vanadium oxide |
| C | 450 | 200 | iron |
| D | 450 | 400 | vanadium oxide |

25 The Contact process is used to manufacture sulfuric acid.

Which statement about the Contact process is **not** correct?

- A** A nickel catalyst is used.
- B** Sulfur dioxide reacts with oxygen to form sulfur trioxide.
- C** Sulfur burns to form sulfur dioxide.
- D** Sulfur trioxide dissolves in concentrated sulfuric acid to form oleum.

26 What reacts with ethene to form ethanol?

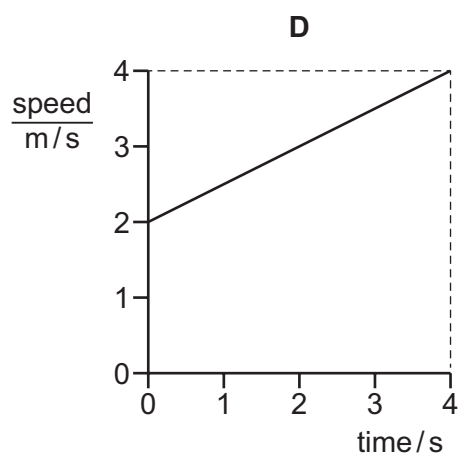
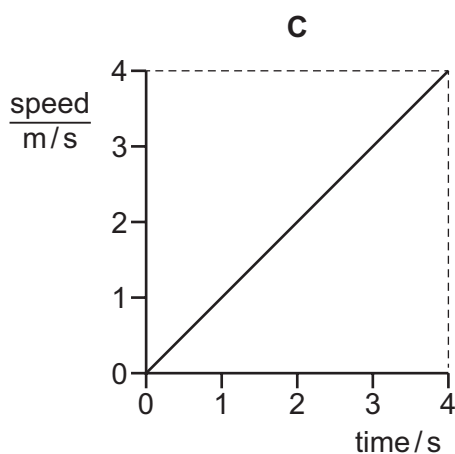
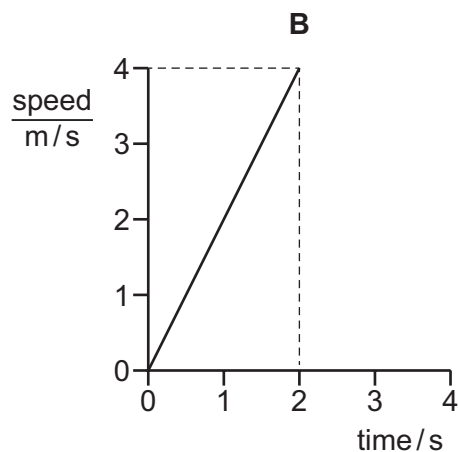
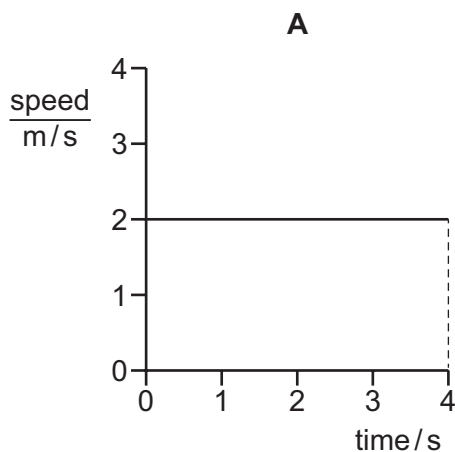
- A bromine
- B hydrogen
- C oxygen
- D steam

27 Poly(ethene) is made from ethene by the process of addition polymerisation.

Which word describes ethene in this process?

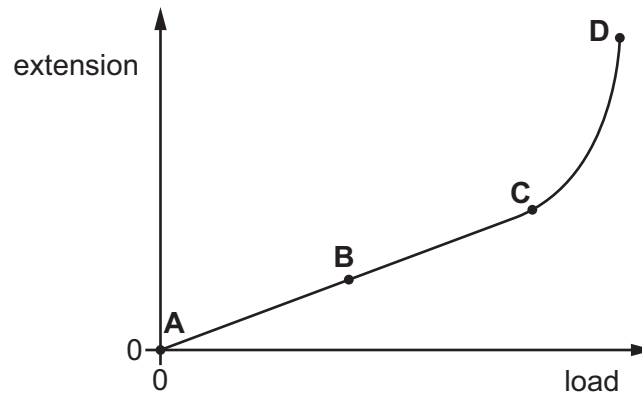
- A fuel
- B catalyst
- C monomer
- D solvent

28 Which speed–time graph represents an object moving with an acceleration of 2.0 m/s^2 ?



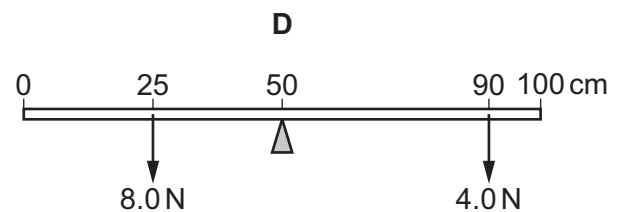
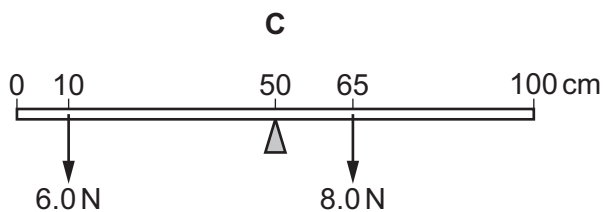
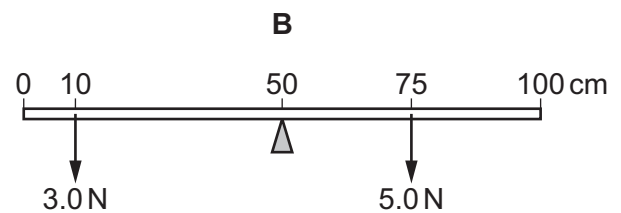
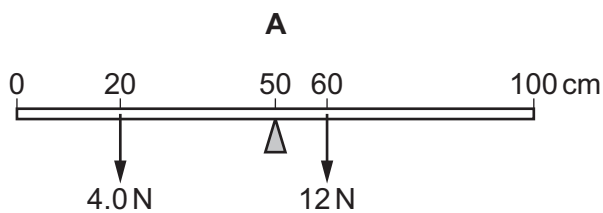
29 The diagram shows the extension–load graph for a spring.

Which labelled point is the limit of proportionality of the spring?



30 The diagrams show uniform metre rules each pivoted at the 50 cm mark. Different weights are placed on the rules at different distances from the 0 cm end as shown.

Which rule rotates in a clockwise direction?



31 Electricity is generated in power stations. Many power stations use steam to drive turbines.

Which type of power station does **not** use steam?

- A chemical energy (fuel) power stations
- B geothermal energy power stations
- C hydroelectric energy power stations
- D nuclear energy power stations

32 What is meant by the *sensitivity* of a liquid-in-glass thermometer?

- A how quickly the thermometer shows a change in temperature
- B the accuracy of the thermometer
- C the amount of change in the length of the liquid column per degree Celsius temperature rise
- D the difference between the maximum and the minimum temperatures that the thermometer can measure

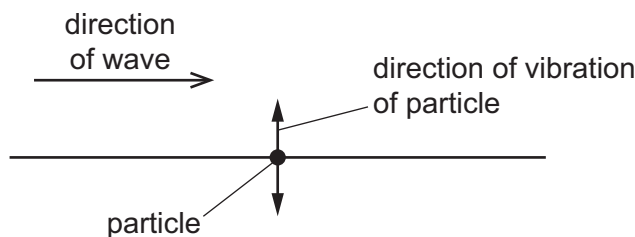
33 Three identical metal cans X, Y and Z are painted. X is painted dull black, Y is painted dull white and Z is painted shiny silver.

All three cans are filled with the same amount of water at 100 °C. They are left in a cool room for the same amount of time.

Which row shows possible temperatures of the water in each of the cans after this time?

| | temperature of water in X/°C | temperature of water in Y/°C | temperature of water in Z/°C |
|----------|------------------------------|------------------------------|------------------------------|
| A | 35 | 39 | 42 |
| B | 35 | 42 | 39 |
| C | 42 | 39 | 35 |
| D | 42 | 35 | 39 |

34 The diagram shows the direction of a wave that passes a particle. The particle is made to vibrate by the wave. The direction of vibration of the particle is shown.

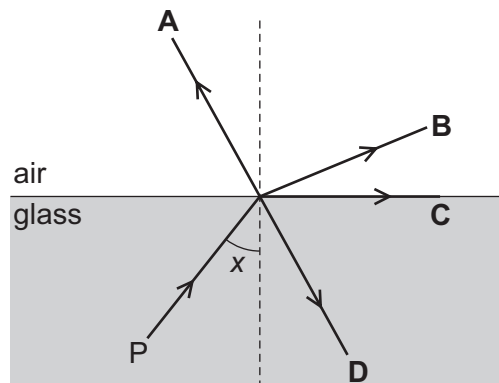


Which row states the type of wave that passes the particle, and gives an example of this type of wave?

| | type of wave | example |
|----------|--------------|---------|
| A | longitudinal | light |
| B | longitudinal | sound |
| C | transverse | light |
| D | transverse | sound |

- 35 The diagram shows a ray of light travelling in glass from point P. Angle x is greater than the critical angle.

In which labelled direction does the ray continue?



- 36 Which list consists of three regions of the electromagnetic spectrum in order of increasing frequency (lowest first)?

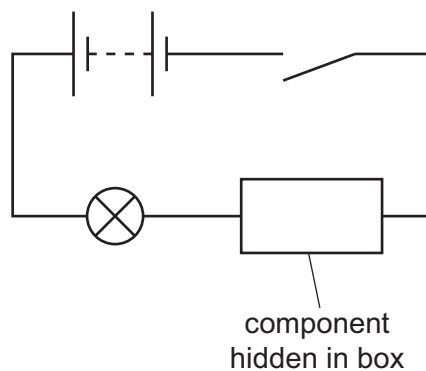
- A microwaves, radio waves, ultraviolet waves
- B microwaves, ultraviolet waves, radio waves
- C radio waves, microwaves, ultraviolet waves
- D ultraviolet waves, radio waves, microwaves

- 37 There is a current of 12 A in an electric kettle.

How much charge passes through the kettle in one minute?

- A 0.20 C
- B 5.0 C
- C 12 C
- D 720 C

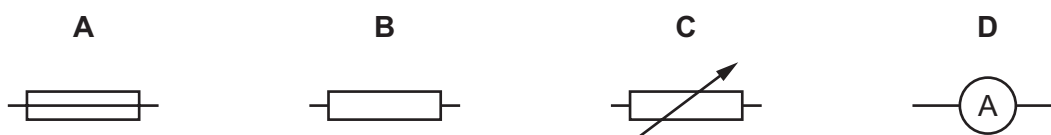
- 38 The series circuit shown includes a single component hidden in a box. The switch is open.



The switch is now closed and the lamp lights briefly before going off.

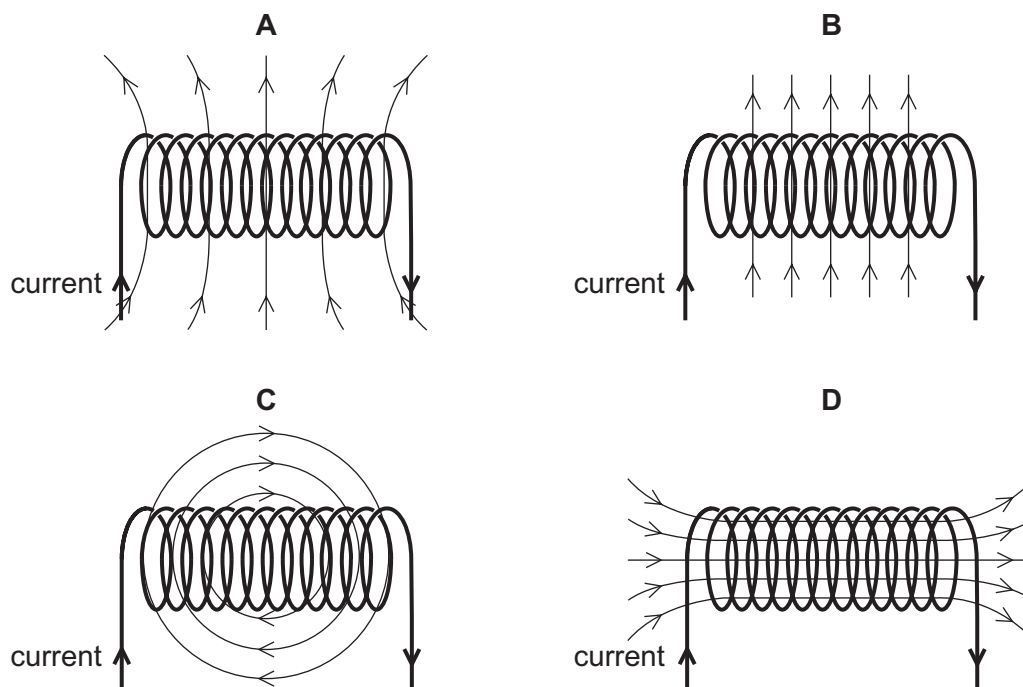
The switch is now opened, and then closed again. This time the lamp does **not** light.

Which symbol represents the component in the box?



- 39 A solenoid carrying a current produces a magnetic field.

Which diagram shows the magnetic field pattern?



40 Which type of radiation has the greatest ionising effect?

- A infrared rays
- B α -particles
- C β -particles
- D γ -rays

BLANK PAGE

BLANK PAGE

Permission to reproduce items where third-party owned material protected by copyright is included has been sought and cleared where possible. Every reasonable effort has been made by the publisher (UCLES) to trace copyright holders, but if any items requiring clearance have unwittingly been included, the publisher will be pleased to make amends at the earliest possible opportunity.

To avoid the issue of disclosure of answer-related information to candidates, all copyright acknowledgements are reproduced online in the Cambridge Assessment International Education Copyright Acknowledgements Booklet. This is produced for each series of examinations and is freely available to download at www.cambridgeinternational.org after the live examination series.

Cambridge Assessment International Education is part of the Cambridge Assessment Group. Cambridge Assessment is the brand name of the University of Cambridge Local Examinations Syndicate (UCLES), which itself is a department of the University of Cambridge.

The Periodic Table of Elements

| | | Group | | | | | | | | |
|----------------------------|-----------------------------|--|--------------------------------|---------------------------------|------------------------------|------------------------------|-------------------------------|------------------------|--|--|
| I | II | III | IV | V | VI | VII | VIII | | | |
| | | 1 H hydrogen 1 | | | | | | | | |
| 3 Li lithium 7 | 4 Be beryllium 9 | Key atomic number atomic symbol name relative atomic mass | | | | | | 2 He helium 4 | | |
| 11 Na sodium 23 | 12 Mg magnesium 24 | 5 B boron 11 | 6 C carbon 12 | 7 N nitrogen 14 | 8 O oxygen 16 | 9 F fluorine 19 | 10 Ne neon 20 | | | |
| 19 K potassium 39 | 20 Ca calcium 40 | 13 Al aluminium 27 | 14 Si silicon 28 | 15 P phosphorus 31 | 16 S sulfur 32 | 17 Cl chlorine 35.5 | 18 Ar argon 40 | | | |
| 37 Rb rubidium 85 | 38 Sr strontium 88 | 31 Ga gallium 70 | 32 Ge germanium 73 | 33 As arsenic 75 | 34 Se selenium 79 | 35 Br bromine 80 | 36 Kr krypton 84 | | | |
| 55 Cs caesium 133 | 56 Ba barium 137 | 49 In indium 115 | 50 Sn tin 119 | 51 Sb antimony 122 | 52 Te tellurium 128 | 53 I iodine 127 | 54 Xe xenon 131 | | | |
| 87 Fr francium — | 88 Ra radium — | 81 Tl thallium 204 | 82 Pb lead 207 | 83 Bi bismuth 209 | 84 Po polonium — | 85 At astatine — | 86 Rn radon — | | | |
| | | 29 Cu copper 64 | 28 Ni nickel 59 | 27 Co cobalt 59 | 26 Fe iron 56 | 25 Mn manganese 55 | 30 Zn zinc 65 | | | |
| | | 47 Ag silver 108 | 46 Pd palladium 106 | 45 Rh rhodium 103 | 44 Ru ruthenium 101 | 43 Tc technetium — | 48 Cd cadmium 112 | | | |
| | | 79 Au gold 197 | 78 Pt platinum 195 | 77 Ir iridium 192 | 76 Os osmium 190 | 75 Re rhenium 186 | 80 Hg mercury 201 | | | |
| | | 111 Rg roentgenium — | 110 Ds darmstadtium — | 109 Mt meitnerium — | 108 Hs hassium — | 107 Bh bohrium — | 112 Cn copernicium — | | | |
| | | 65 Tb terbium 159 | 64 Gd gadolinium 157 | 63 Eu europium 152 | 62 Sm samarium 150 | 61 Pm promethium — | 66 Dy dysprosium 163 | | | |
| | | 97 Bk berkelium — | 96 Cm curium — | 95 Am americium — | 94 Pu plutonium — | 93 Np neptunium — | 98 Cf californium — | | | |
| | | 100 Fm fermium — | 100 Fm fermium — | 100 Fm fermium — | 100 Fm fermium — | 100 Fm fermium — | 100 Fm fermium — | | | |
| | | 67 Ho holmium 165 | 68 Er erbium 167 | 69 Tm thulium 169 | 70 Yb ytterbium 173 | 71 Lu lutetium 175 | 70 Yb ytterbium 173 | | | |
| | | 99 Es einsteinium — | 100 Fm fermium — | 101 Md mendelevium — | 102 No nobelium — | 103 Lr lawrencium — | 102 No nobelium — | | | |
| | | 57 La lanthanum 139 | 58 Ce cerium 140 | 59 Pr praseodymium 141 | 60 Nd neodymium 144 | 61 Pm promethium — | 62 Sm samarium 150 | | | |
| | | 89 Ac actinium — | 90 Th thorium 232 | 91 Pa protactinium 231 | 92 U uranium 238 | 93 Np neptunium — | 94 Pu plutonium — | | | |

lanthanoids

actinoids

The volume of one mole of any gas is 24 dm³ at room temperature and pressure (r.t.p.).