# Mark scheme

## Atomic structure

Chemistry 0620 · Questions from Paper 3 and Paper 4

Total marks

**80**

### MARKS FOR EACH QUESTION

| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | Total |
|---|---|---|---|---|---|---|---|---|---|---|
| 4 | 5 | 7 | 7 | 8 | 9 | 8 | 9 | 10 | 13 | **80** |

## Question 1 [4]

| | | |
|---|---|---|
| 1(a) | mixture | 1 |
| 1(b) | element | 1 |
| 1(c) | compound | 1 |
| 1(d) | mixture | 1 |

## Question 2 [5]

| | | |
|---|---|---|
| 2 | **M1** : C*l*: 17 **AND** 20 (1)<br>**M2** $Cu^{+}$: 29 **AND** 28 (1)<br>**M3** 33(above) **and** 16(below) on left hand side of symbol (1)<br>**M4** S (1)<br>**M5** $2^{-}$ (1) | 5 |

## Question 3 [7]

| | | |
|---|---|---|
| 3(a) | 11 | 1 |
| 3(b) | 38 | 1 |
| 3(c) | 2,8,8 | 1 |
| 3(d)(i) | B, C and E | 1 |
| 3(d)(ii) | A | 1 |
| 3(d)(iii) | D | 1 |
| 3(d)(iv) | B and C | 1 |

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## Question 4 [7]

| | | |
|---|---|---|
| 4(a) | **M1** 11<br>**M2** 18<br>**M3** 2.8.8<br>**M4** –1 | **4** |
| 4(b) | A **and** B | **1** |
| 4(c) | Li / Lithium | **1** |
| 4(d) | it has a complete **or** full **or** 8 electrons in the outer shell | **1** |

## Question 5 [8]

| | | |
|---|---|---|
| 5(a)(i) | D | **1** |
| 5(a)(ii) | E | **1** |
| 5(a)(iii) | B | **1** |
| 5(a)(iv) | D | **1** |
| 5(a)(v) | D | **1** |
| 5(b) | number of electrons in F ion = 10 (1)<br>number of neutrons in Br = 46 (1)<br>number of protons in Br = 35<br>**AND**<br>number of protons in F ion = 9 (1) | **3** |

## Question 6 [9]

| | | |
|---|---|---|
| 6(a)(i) | B / chlorine / $Cl_2$; | **1** |
| 6(a)(ii) | C / KCl / potassium chloride; | **1** |
| 6(a)(iii) | B;<br>has only one type of atom; | **2**<br>1<br>1 |
| 6(a)(iv) | $C_3H_3F_3Cl_2$; | **1** |
| 6(b)(i) | different number of neutrons / different mass numbers / different numbers of nucleons; | **1** |
| 6(b)(ii) | 18; | **1** |
| 6(b)(iii) | 7 electrons in the outer shell;<br>first shell has 2 electrons and second shell has 8 electrons; | **2**<br>1<br>1 |

## Question 7 [8]

| | | |
|---|---|---|
| 7(a)(i) | number of protons (are the same) / 16 protons (1)<br>number of electrons (are the same) / 16 electrons (1)<br>number of neutrons (are different) / 16,17 neutrons (1) | **3** |
| 7(a)(ii) | **number** of protons is the same as (the number of) electrons | **1** |
| 7(a)(iii) | same **number** of (outer shell) electrons | **1** |
| 7(b)(i) | (they have) **two** more electrons than protons | **1** |
| 7(b)(ii) | $P^{3-}$ **OR** $Cl^-$ (1)<br>$K^+$ **OR** $Ca^{2+}$ (1) | **2** |

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## Question 8 [9]

**8** **(a)** **(i)** same number of protons and electrons [1]

**(ii)** all have the same number of protons / same proton number / same atomic number [1]

**(iii)** more electrons than protons [2]
number of protons and electrons not equal **ONLY** [1]

**(iv)** same number of protons (and electrons) / same proton number / same atomic number [1]
different number of neutrons / different mass number / nucleon number [1]

**(b)** **(i)** 2 + 8 + 5 [1]

**(ii)** 3 / 5 [1]

**(iii)** non-metal because it accepts electrons
/ needs 3e to complete outer energy level
/ because it is in Group V or 5e in outer shell [1]
**note** need both non-metal and reason for [1]

**[Total: 9]**

## Question 9 [10]

**9**(a) — **2**

| **M1** charge (1) | **M2** mass(1) |
|---|---|
| –1 | |
| | 1 |
| +1 | 1 |

1 mark for each correct column

**9**(b)(i) — **3**

| electron | neutron | proton |
|---|---|---|
| 19 | 20 | 19 |
| 18 | 22 | 19 |

1 mark for each correct column

**9**(b)(ii) — **2**

**M1** (41 × 10) + (39 × 90) = 3920 (1)

**M2** (3920 ÷ 100) = 39.2(1)

**9**(b)(iii) — aluminium has only 1 isotope which has nucleon number 27 — **1**

**9**(c) — **2**

**M1** Ar (1)

**M2** $P^{3-}$ or $S^{2-}$ or $Cl^{-}$ (1)

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## Question 10 [13]

| | | |
|---|---|---|
| **10**(a) | number of protons (1)<br>protons in the nucleus (of an atom) (1) | **2** |
| **10**(b)(i) | 12p 12n 12e (1)<br>12p 14n 12e (1) | **2** |
| **10**(b)(ii) | isotope(s) | **1** |
| **10**(b)(iii) | same number of electrons (1)<br>(same number) of electrons in the outer shell (1) | **2** |
| **10**(c) | $^{9}_{4}Be$<br>any element symbol with a single negative charge (1)<br>use of C$l$ (1)<br>use of $^{37}_{17}$ (1) | **4** |
| **10**(d) | 2 8 3 (1)<br>2 8 8 (1) | **2** |

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