01. 0620_w21_ms_43 Q: 4

Question	Answer	Marks
(a)	1 mark for each row 6 6 6 6 6 7	2
(b)	diamond **and** graphite	1
(c)(i)	**M1** (22 ÷ 44 =) 0.5 (moles) (1) **M2** 3.01×10^{23}(1)	2
(c)(ii)	1.505×10^{23}	1

02. 0620_s20_ms_41 Q: 1

(a)(i)	protons	1
	neutrons	1
(a)(ii)	nucleon number	1
(a)(iii)	34	1
(a)(iv)	2 : 8 : 8	1
(a)(v)	AlX_3	1
(b)(i)	isotopes	1
(b)(ii)	^{12}C	1
(b)(iii)	a mole	1
(b)(iv)	Avogadro constant	1
(c)	M1 $(3 \times 69) + (2 \times 71)$ M2 $= \frac{349}{5} = 69.8$ M3 Y = Ga / gallium	3
(d)(i)	phosphorus / P	1
(d)(ii)	gains electrons three electrons (when forming ion)	2

03. 0620_w19_ms_43 Q: 5

	M1 5 moles of calcium nitrate (1) **M2** 10 moles ammonium nitrate (1) or ecf **M1** □ 2 **M 3** M_r of ammonium nitrate = 80 **M4** 800 g or ecf **M2** □ **M3**	**4**

04. 0620_s18_ms_41 Q: 4

(a)	relative atomic mass	**1**
(b)	C_4H_{10} is covalent	**1**
	KF is ionic	**1**
(c)	mol of **Y** = 0.060 / 24.0 = 2.5 □ 10^{-3} or 0.0025	**1**
	M_r = 0.095 / 2.5 □ 10^{-3} = 38(.0)	**1**
	fluorine	**1**
(d)	mass of O = 3.87 g – 1.68 g = 2.19 (g)	**1**
	mol of P and mol of O 1.68 / 31 OR 0.054.. 2.19 / 16 **OR** 0.13…	**1**
	ratio of P to O P = 0.054… / 0.054 O = 0.13… / 0.054… = 1 = 2.5	**1**
	whole number ratio and P_2O_5 = 2 = 5	**1**
(e)	the formula is P_4O_6 or (one mole of) P_2O_3 = 110 (g)	**1**
	mass = 220 (g)	**1**

05. 0620_m17_ms_42 Q: 6

(a)(i)	**M1** (relative formula mass $BaCO_3$ =) 197	**1**
	M2 (10.0/197 =) 0.0508 (0.0508 alone scores [2])	**1**
(a)(ii)	1.22	**1**
(b)	2.24	**1**
(c)(i)	0.00219	**1**
(c)(ii)	**M1** moles HC*l* = 2 □ 0.00219 **OR** correct evaluation of this (= 0.00438)	**1**
	M2 (0.00438/0.01875) = 0.234 (0.234 alone scores [2])	**1**

06. 0620_w16_ms_41 Q: 7

(a)	0.025 **M1** 50 / 1000 (=0.05) **M2** (0.05 × 0.5) = 0.025	 **1** **1**
(b)	0.0125	**1**
(c)	0.55 **M1** 44 **M2** 0.55	 **1** **1**
(d)	0.3	**1**

07. 0620_s13_ms_32 Q: 8

(a) (i) (the number of particles which is equal to the number of atoms in) 12 g of carbon 12
or
the mass in grams which contains the Avogadro's constant number of particles
or
Avogadro's constant **or** 6 to 6.023 × 10^{23} of atoms / ions / molecules / electrons / particles
or
(the amount of substance which has a mass equal to) its relative formula mass / relative atomic mass / relative molecular mass in grams
or
(the amount of substance which has a volume equal to) 24 dm^3 of a gas at RTP
[1]

(ii) (Avogadro's constant is the) number of particles / atoms / ions / molecules in one mole of a substance
or
the number of carbon atoms in 12 g of C(12).
or
the number of particles / molecules in 24 dm^3 of a gas at RTP
or
6 to 6.023 × 10^{23} (particles / atoms / ions / molecules / electrons) [1]

(b) CH_4 **and** SO_2 [1]

2/16 = 1/8 or 0.125 moles of CH_4 **AND** 8/64 = 1/8 or 0.125 moles of SO_2 [1]

(c) (i) 4.8/40 = 0.12 moles of Ca
3.6/18 = 0.2 moles of H_2O **both** correct [1]

(ii) Ca is in excess (**no mark**) (because 0.12 moles of Ca need) 0.24 moles / 4.32 g of H_2O to react [1]
there is not enough / there are 0.2 moles / 3.6 g of H_2O [1]
or
Ca is in excess **(no mark)** (because 0.2 moles / 3.6 g of water will react with) 0.1moles/4.0 g of Ca [1]
there is more than that / there are 0.12 moles / 4.8 g of Ca [1]
or
Ca is in excess **(no mark)** because the mole ratio Ca:H_2O is 3:5 / mass ratio 4:3 [1]
which is bigger than the required mole ratio of 1:2 / mass ratio 10:9 [1]
or
Ca is in excess **(no mark)** because the mole ratio H_2O:Ca is 5:3 / mass ratio 3:4 [1]
which is smaller than the required mole ratio of 2:1 / mass ratio 9:10 [1]

(iii) 0.02 × 40 = 0.8 (g) [1]