Cambridge Assessment International Education

Cambridge IGCSE®

CHEMISTRY **0620/03**

Paper 3 Theory (Core) **For examination from 2020**

MARK SCHEME

Maximum Mark: 80

Specimen

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mark scheme abbreviations

;	separates marking points
/	alternative responses for the same marking point
not	do not allow
allow	accept the response
ecf	error carried forward
avp	any valid point
ora	or reverse argument
owtte	or words to that effect
underline	actual word given must be used by candidate (grammatical variants excepted)
( )	the word / phrase in brackets is not required but sets the context
max	indicates the maximum number of marks
Any [number] from:	accept the [number] of valid responses
note:	additional marking guidance

1 **(a)** diamond:
covalent;
giant structure / macromolecule;
chlorine: any two of:
molecule;
covalent;
diatomic; [4]

(b) C_6Cl_{12} [1]

(c) **(i)** green / yellow-green / light green [1]

(ii) value between 2.5–4(.0) (g per dm^3) (actual = 3.12) [1]

(iii) increases [1]

(d) **(i)** potassium bromide [1]
not: potassium bromine

iodine [1]
not: iodide

(ii) chlorine is <u>more</u> reactive than bromine / ora [1]
not: chloride is more reactive than bromide

(e) solubility in water:
ionic compounds are soluble **and** molecular compounds are not soluble [1]
note: both needed for mark

electrical conductivity:
ionic compounds conduct electricity <u>when molten</u> / <u>in</u> (aqueous) <u>solution</u>
and molecular compounds do not [1]
note: both needed for mark

2 **(a)** Br_2 [1]

(b) Any three of: [3]
bromine evaporates / liquid evaporates;
more energetic particles change from liquid to vapour or gas;
diffusion;
random movement of particles / particles move everywhere / <u>air</u> and <u>bromine</u> particles are moving;
(bromine and air) particles get mixed up / collision of <u>bromine</u> and <u>air</u> particles;
allow: molecules in place of particles

3 **(a)** **E** / nitrogen (di)oxide / NO_2 [1]

(b) **B** / potassium nitrate / KNO_3 [1]

(c) **A** / ammonia / NH_3 [1]

(d) **E** / nitrogen (di)oxide / NO_2 [1]

(e) **C** / NI_3 / nitrogen (tri)iodide [1]

(f) **B** / potassium nitrate / KNO_3 [1]

4 **(a)** calcium oxide [1]
allow: CaO

(b) <u>thermal decomposition</u> [1]

(c) carbon dioxide has been removed from the limestone / it comes from the limestone / carbon dioxide is a product [1]

(d) neutralising acidic soils / treating acidic lakes / flue gas desulfurisation
allow: any suitable use [1]

(e) temperature of Bunsen / distance of Bunsen from the tube / mass of carbonate used / owtte [1]

(f) **(i)** calcium carbonate [1]

(ii) 27 (cm^3) [1]

(iii) calcium faster than strontium which is faster than barium / idea of trend down the group; [1]
correct trend, i.e. less rapid reaction the further down the group / ora; [1]

(g) add acid to carbonate; [1]
bubble gas or carbon dioxide (evolved) through limewater / test gas or carbon dioxide with limewater; [1]
limewater goes milky or cloudy; [1]

5 **(a)** Any three of:
high melting / boiling point;
high density;
form coloured compounds or have coloured ions;
form ions of more than one charge / variable valency / variable oxidation state;
allow: form complex ions; hard / hardness; catalysts; [3]

(b) **(i)** different number of neutrons / different nucleon number [1]

(ii) 31 [1]

(iii) 23 [1]

(c) suitable method, e.g. coating with paint / zinc / unreactive metal / plastic / oil / grease / galvanising / sacrificial protection; [1]
suitable reason, e.g. stops air / water reaching surface; [1]
note: reason must be consequential to the method chosen

(d) Any two of:
recycling promotes sustainable development / owtte;
uses less energy than extraction;
preserves limited natural resources;
correct reference to cost;
reference to landfill; [2]

(e) Fe_2O_3 / iron oxide; [1]
it loses oxygen / gains electrons / iron decreases oxidation number; [1]

(f) **(i)** incomplete combustion / insufficient or limited or not enough oxygen [1]

(ii) toxic / suffocates you / stops red blood cells carrying oxygen / binds with hemoglobin in place of oxygen [1]

6 **(a)** break down (of substance / electrolyte) by electricity / splitting up of substance by electricity / decomposition by electricity [1]
allow: current / voltage for electricity

(b) anode [1]

(c) hydrogen [1]
allow: H_2

(d) platinum; [1]
inert; [1]

(e) **(i)** 2,8,7 as shown in an electron shell diagram [1]

(ii) pair of electrons between two chlorine atoms; [1]
rest of electrons correct; [1]

(iii) (damp) litmus (paper) / Universal indicator (paper); [1]
allow: indicator paper / pH paper

bleaches / goes white / goes red then bleaches; [1]

(f) **(i)** calcium chloride + water (1 mark each) [2]
not: calcium chlorine

(ii) 2 on left; [1]
H_2 on right; not: 2H [1]

7 **(a)** **(i)** 78 (%) [1]
allow: 78–80

(ii) Any two of: [2]
carbon dioxide; argon; neon; xenon; helium; radon; water;
not: hydrogen

(b) **(i)** decreases / gets less / gets lower / gets used up [1]

(ii) increases / gets more / greater [1]

(c) any suitable use e.g. electrical conductor / electrical wiring / saucepans [1]

8 **(a)** **(i)** (group of) molecules with similar boiling points / (group of) molecules with similar relative molecular masses / molecules with limited range of boiling points / molecules with limited range of molecular masses / molecules coming off at the same place in the fractionation column / owtte [1]

(ii) $C_{10}H_{22}$
allow: reasonable mixtures, e.g. $C_7H_{16} + C_3H_6$ [1]

(b) refinery gas: (fuel) for heating / (fuel) for cars / (fuel) for cooking; [1]
gasoline: (fuel) for cars / mowers etc.; [1]

(c) unsaturated: contains double bonds / contains C=C bonds; [1]
hydrocarbon: containing carbon and hydrogen only; [1]

(d) **(i)** 1st box down ticked (catalytic addition of steam) [1]

(ii) correct structure of ethanol; [1]
bond between O-H; [1]

(e) monomers; [1]
polymers; [1]

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