

JUNE 2002

INTERNATIONAL GCSE

MARK SCHEME

MAXIMUM MARK : 80

SYLLABUS/COMPONENT : 0652/3

**PHYSICAL SCIENCE
(EXTENDED)**



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NOTE: in some cases a statement equivalent to the answer given here is acceptable.

1

- (a) germanium density: in range 4.2 to 5.6 ①
 silicon structure: giant covalent both words ①
 tin oxide: amphoteric ①

- (b) change of structure down group (of solid) ①
The underlined part must be clearly implied.

further statement ①
 from giant covalent to metallic ✓
 with different characteristics ✓

Note that the melting point of the element decreases then increases down the group.

- (c) different structures of solid ① *If structures are named, must be correct.*
 with atoms closer together for greater density ①
NOT 'isotopes' because this would give too small a change of density.
The carbon allotrope listed in Fig. 1.1 is graphite; this other form is diamond.

Total for question 1 : 7 marks

2

- (a) speed does not have a direction OR speed is a scalar quantity ①
 velocity does have a direction OR velocity is a vector quantity ①
The comparison must be clear for two marks.

- (b) Any symbols used must be correct, as listed in the syllabus.

- (i) change of speed / time taken OR $(30 - 20) / 5$ ①

$$\frac{2}{\text{m/s}^2}$$
 OR ms^{-2} ①
Do not accept m/s^{-2} nor m/s/s .

- (ii) mass × acceleration OR $600 \times 2^*$ OR
 1200 ①
 N ①
** value from (i)*

Do not accept any conversion into weight.

- (c) friction OR drag OR air resistance ①
 further statement ①
 The engine must exert a force to overcome this. ✓
 There is friction in the bearings, etc. ✓
Answer must be about forces, not energy.

Total for question 2 : 10 marks

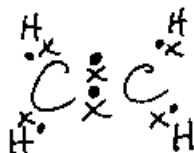
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3



CH₄ ①
balanced ①

(b) for example



C=C double bond of shared electrons ①
correctly filled outer shells ①

(c) (i) ethene has double bond (between carbon atoms) (which allows reaction) ①
ethane has only single bond (between carbon atoms) ①
'Ethene is unsaturated and ethane is saturated' scores only one mark.

(ii) (add bromine-water to hydrocarbon)
ethene decolourises bromine (quickly) ①
ethane does not decolourise bromine ①

*The comparison must be clear for two marks.
For full marks there must be a clear statement about what is seen.*

Total for question 3 : 8 marks

4

(a) (i) fusion ① NOT 'fission'.

(ii) Sun OR star ①
*Accept 'hydrogen bomb' but not 'atomic bomb'.
Do not carry an error in (i) forward into (ii).*

(iii) each nucleus is positive ①
and repel each other ①

(b) (i) same atomic number OR same proton number ①
different mass number OR different nucleon or neutron number ①
Both statements must be clear for two marks.

(ii) one proton ①
one neutron ①

(iii) $E = mc^2$ ① *Must be c not v.*
 $m = \text{loss of mass} = 0.03 \times 10^{-27} \text{ (kg)}$ OR $3.0 \times 10^{-29} \text{ (kg)}$ ①
evidence that 3.0×10^8 has been squared ①
energy = $2.7 \times 10^{-12} \text{ (J)}$ ①
Check powers of ten.

Total for question 4 : 12 marks

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5

- (a) (lattice of) positive ions ①
 (in a) sea of electrons ①
 ions and electrons attract ①
- (b) different sizes of (copper and tin) ions ①
 layers do not slide (over each other) easily ①
- (c) copper wires are flexible OR can be bent repeatedly ①
Accept statement that copper is ductile OR malleable.
 copper is good conductor of electricity ①
Ignore any comment about heat.
Comparison with bronze must be implied.

Total for question 5 : 7 marks

6

- (a) *Any symbols used must be correct, as listed in the syllabus.*
 $P = IV$ OR equivalent in words ①
 evidence that 3 kW has been changed to 3000 W ①
 current = 12 A complete answer ①
- (b) *Any symbols used must be correct, as listed in the syllabus.*
 $R = V/I$ OR equivalent in words ①
 $250 / 12^*$ ①
 * value from (i)
 resistance = 20.8 Ω OR 21 Ω complete answer ①
- (c) (i) longer OR equivalent statement ①
 (ii) thinner OR equivalent statement ①

Total for question 6 : 8 marks

7

- (a) (i) coating (iron) with zinc ①
 (ii) zinc is more reactive than iron ①
 so zinc coating 'corrodes away' instead of iron ①
idea of this, but not repetition of text in question paper
- (iii) aluminium has already (rapidly) reacted with (oxygen in) air ①
 to form a protective layer of oxide ①
Note that aluminium does not 'rust'; only iron does this.
- (b) (i) hydrochloric acid complete answer ①
 (ii) add zinc oxide to the acid until there is excess unreacted zinc oxide ①
 filter off the (excess) zinc oxide ①
 (iii) leave (filtrate) at room temperature to crystallise ①
Must be clear that the solution is NOT heated.

Total for question 7 : 9 marks

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8

- (a) (i) two different metals (wires) (joined together at one end) \oplus
NOT a 'bimetallic' arrangement.
- (ii) used for high temperatures OR rapidly changing temperatures \oplus
- (iii) *The thermocouple is controlled by the temperature of the air coming from the room for the combustion process. So the correct answer is 'convection currents ✓ of the air in the room ✓'.
 However, for this particular question, accept*
 conduction OR convection OR radiation \oplus
 through (by) the air \oplus
- (b) (i) 'silvery' OR 'shiny' \oplus
*Do not give a mark where there is a contradiction for this situation.
 For example: 'shiny black' is not acceptable.*
- (ii) infra-red complete answer \oplus

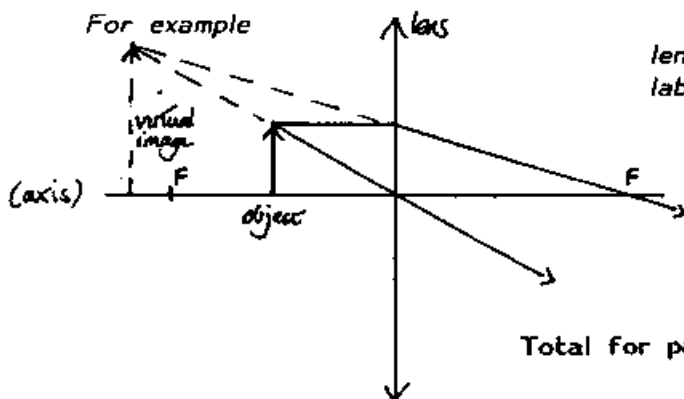
Total for question 8 : 6 marks

9

- (a) (i) $14 + 16$ \oplus
 30 \oplus
- (ii) $150 / 30^*$ \oplus
** value from (i)*
 volume = $5 \times 24 = 120$ (dm³) answer \oplus
- (iii) 5 mol NO(g) form $2\frac{1}{2}$ mol N₂(g) OR equivalent step \oplus
 volume = $120^* / 2 = 60$ (dm³) answer \oplus
** value from (ii)*
- (b) incomplete combustion \oplus
*Note that 'incomplete' must be one word.
 of hydrocarbons (in air) \oplus
 Do not accept 'petrol' or 'carbon'.*
- (c) stops oxygen combining (reversibly) with haemoglobin OR equivalent comment \oplus

Total for question 9 : 9 marks

10



- lens & object & image & focus all marked and
 labelled with a clear line for the axis \oplus
 correct construction \oplus
 virtual image clearly shown \oplus
 magnified image \oplus*

Total for question 10 : 4 marks

Total for paper : 80 marks