

**Wednesday 30 May 2012 – Afternoon**

**GCSE TWENTY FIRST CENTURY SCIENCE  
ADDITIONAL SCIENCE A**

**A218/01** Unit 4: Ideas in Context (Foundation Tier)

Candidates answer on the Question Paper.  
A calculator may be used for this paper.

**OCR supplied materials:**

- Insert (inserted)

**Other materials required:**

- Pencil
- Ruler (cm/mm)

**Duration:** 45 minutes



Candidate  
forename

Candidate  
surname

Centre number


Candidate number

**MODIFIED LANGUAGE**

**INSTRUCTIONS TO CANDIDATES**

- The Insert will be found in the centre of this document.
- Write your name, centre number and candidate number in the boxes above. Please write clearly and in capital letters.
- Use black ink. HB pencil may be used for graphs and diagrams only.
- Answer **all** the questions.
- Read each question carefully. Make sure you know what you have to do before starting your answer.
- Write your answer to each question in the space provided. Additional paper may be used if necessary but you must clearly show your candidate number, centre number and question number(s).
- Do **not** write in the bar codes.

**INFORMATION FOR CANDIDATES**

- The number of marks is given in brackets [ ] at the end of each question or part question.
- The total number of marks for this paper is **40**.
- A list of physics equations is printed on page 2.
- The Periodic Table is printed on the back page.
-  Where you see this icon you will be awarded marks for the quality of written communication in your answer.
- This document consists of **12** pages. Any blank pages are indicated.

**TWENTY FIRST CENTURY SCIENCE EQUATIONS****Useful Relationships****Explaining Motion**

$$\text{speed} = \frac{\text{distance travelled}}{\text{time taken}}$$

$$\text{momentum} = \text{mass} \times \text{velocity}$$

$$\text{change of momentum} = \text{resultant force} \times \text{time for which it acts}$$

$$\text{work done by a force} = \text{force} \times \text{distance moved in the direction of the force}$$

$$\text{change in energy} = \text{work done}$$

$$\text{change in GPE} = \text{weight} \times \text{vertical height difference}$$

$$\text{kinetic energy} = \frac{1}{2} \times \text{mass} \times [\text{velocity}]^2$$

**Electric Circuits**

$$\text{resistance} = \frac{\text{voltage}}{\text{current}}$$

$$\frac{\text{voltage across primary coil}}{\text{voltage across secondary coil}} = \frac{\text{number of turns in primary coil}}{\text{number of turns in secondary coil}}$$

$$\text{energy transferred} = \text{power} \times \text{time}$$

$$\text{power} = \text{potential difference} \times \text{current}$$

$$\text{efficiency} = \frac{\text{energy usefully transferred}}{\text{total energy supplied}} \times 100\%$$

**The Wave Model of Radiation**

$$\text{wave speed} = \text{frequency} \times \text{wavelength}$$

**BLANK PAGE**

**Question 1 starts on page 4**

**PLEASE DO NOT WRITE ON THIS PAGE**

Answer **all** the questions.

**1 This question is based on the article ‘Hypothermia – a hazard for mountaineers’.**

**(a)** A person gets hypothermia if their core body temperature drops below a certain temperature.

**(i)** What is this temperature?

answer ..... °C [1]

**(ii)** Shivering occurs during mild hypothermia.

Explain how shivering raises the core temperature of the body.



One mark will be for writing in sentences with correct spelling, punctuation and grammar.

.....  
 .....  
 ..... [2+1]

**(iii)** Temperature regulation in the human body is an example of homeostasis.

What is homeostasis?

.....  
 ..... [1]

**(iv)** Temperature receptors are found in different parts of the body.

Complete the table to show where the temperature receptors are found.

receptors for the detection of temperature ...	location
... outside the body	.....
... of the blood	.....

[2]

(b) There are three stages of hypothermia described in the article.

(i) Ann is a mountaineer. Her core body temperature is  $31^{\circ}\text{C}$ .

Which stage of hypothermia has she got?

Put a ring around the correct answer.

**mild      moderate      severe**

[1]

(ii) Look at the following data.

140 mountaineers climb a mountain range.

14 develop some form of hypothermia.

7 of the hypothermia patients have a core body temperature below  $28^{\circ}\text{C}$ .

What percentage of the 140 mountaineers have **severe** hypothermia?

Show your working.

answer = ..... % [2]

(c) The article gives advice to reduce the risk of getting hypothermia.

Explain why wearing wet clothes increases the risk of getting hypothermia.

.....  
 .....  
 .....  
 ..... [2]

(d) Respiration is a chemical reaction.

This reaction is controlled by enzymes.

Explain why severe hypothermia is so dangerous to the body.

.....  
 .....  
 .....  
 ..... [2]

[Total: 14]

Turn over

**2 This question is based on the article ‘The dangers and delights of chlorine and bromine’.**

- (a)** Chlorine, bromine and iodine are all elements in group 7.

Some of their properties are shown in the table.

element	melting point in °C	boiling point in °C	density in g/cm <sup>3</sup>
chlorine	–101	–34	0.003
bromine	–7	59	3.1
iodine	114	184	4.9

- (i)** Which element, chlorine, bromine or iodine, has the highest density?

..... [1]

- (ii)** How does the melting point of the elements change down group 7?

..... [1]

- (b)** At room temperature, iodine is a grey element in the solid state.

- (i)** Describe the **colour** and **state** of chlorine and bromine at room temperature.

.....  
 ..... [2]

- (ii)** The article discusses why a large spillage of chlorine is more hazardous than a large spillage of bromine.

Suggest **two** reasons why.

.....  
 .....  
 ..... [2]

- (iii)** If a large chlorine spillage happens, hospitals need to know what type of health problems to expect.

Give **two** health problems, other than death, that chlorine causes.

1 .....

2 ..... [1]

(c) This is one of the hazard symbols for bromine.



(i) What type of hazard does this warning show?

..... [1]

(ii) Some workers are specially trained to work with bromine.

They always wear a lab coat and goggles.

Give **two** other safety precautions that workers should take when they work with bromine.

1 .....

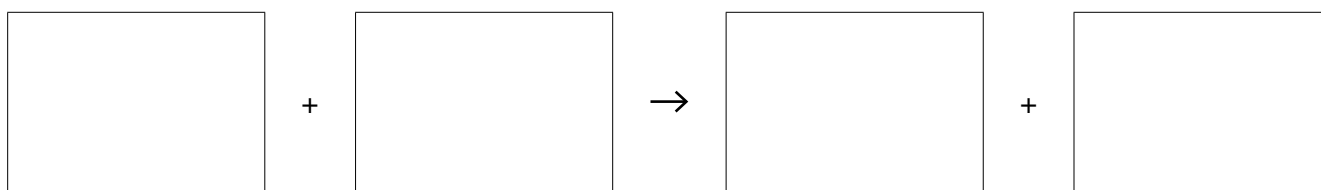
2 ..... [1]

(d) Bromine is made when chlorine reacts with sodium bromide.

The article gives an equation for this reaction.

Iodine can be made from sodium iodide in the same way.

Fill in the boxes to show a **word** equation for the reaction that happens when chlorine reacts with sodium iodide to make iodine.



[2]

(e) The article shows the structure of a chlorine atom.

(i) How many electrons are in one chlorine atom?

answer = ..... [1]

(ii) Fluorine is at the top of group 7.

The arrangement of electrons in a fluorine atom is shown below.

fluorine	2.7
----------	-----

Fill in the box to show the arrangement of electrons in a **chlorine** atom. [1]

chlorine	
----------	--

[Total: 13]



**3 This question is based on the article ‘The National Grid’.**

- (a)** At peak times large power stations together produce a total power of 63 Gigawatts.

The article states that there are 181 large power stations supplying electricity to the National Grid.

On average how much power is each large power station producing at peak times?

average power = ..... Gigawatts [1]

- (b)** The electrical power from a power station is produced by generators.

Suggest **two** ways that the output voltage of a generator could be increased.

.....  
 ..... [2]

- (c) (i)** There are power losses in the National Grid.

How do power losses in the transformers compare to power losses in the cables?

Include numbers in your answer.

.....  
 .....  
 ..... [2]

- (ii)** Why is energy lost in the cables of the National Grid?

.....  
 .....  
 ..... [2]

- (d)** Complete the sentence about mains electricity.

Choose words from this list.

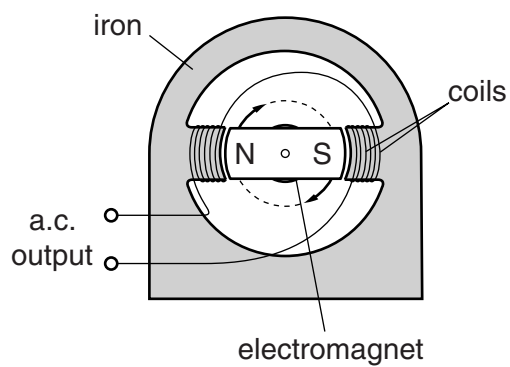
**available    alternating    digital    direct    230    11 k    275 k    400 k**

The mains supply to our homes is ..... current and has a voltage of

..... V. [2]

(e) Describe and explain how this generator produces electricity.

Use the diagram to help you.



.....

.....

.....

.....

..... [4]

[Total: 13]

**END OF QUESTION PAPER**

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# The Periodic Table of the Elements

1	2	3	4	5	6	7	0																																																																																																																																																																																																																																																																																																																																																																																																																																																																						
7 <b>Li</b> lithium 3	9 <b>Be</b> beryllium 4	11 <b>Na</b> sodium 11	12 <b>Mg</b> magnesium 12	13 <b>Al</b> aluminium 13	14 <b>N</b> nitrogen 7	15 <b>P</b> phosphorus 15	16 <b>S</b> sulfur 16	17 <b>Cl</b> chlorine 17	18 <b>Ar</b> argon 18	19 <b>K</b> potassium 19	20 <b>Ca</b> calcium 20	21 <b>Sc</b> scandium 21	22 <b>Ti</b> titanium 22	23 <b>V</b> vanadium 23	24 <b>Cr</b> chromium 24	25 <b>Mn</b> manganese 25	26 <b>Fe</b> iron 26	27 <b>Co</b> cobalt 27	28 <b>Ni</b> nickel 28	29 <b>Cu</b> copper 29	30 <b>Zn</b> zinc 30	31 <b>Ga</b> gallium 31	32 <b>Ge</b> germanium 32	33 <b>As</b> arsenic 33	34 <b>Se</b> selenium 34	35 <b>Br</b> bromine 35	36 <b>Kr</b> krypton 36	37 <b>Rb</b> rubidium 37	38 <b>Sr</b> strontium 38	39 <b>Y</b> yttrium 39	40 <b>Zr</b> zirconium 40	41 <b>Nb</b> niobium 41	42 <b>Mo</b> molybdenum 42	43 <b>Tc</b> technetium 43	44 <b>Ru</b> ruthenium 44	45 <b>Rh</b> rhodium 45	46 <b>Pd</b> palladium 46	47 <b>Ag</b> silver 47	48 <b>Cd</b> cadmium 48	49 <b>In</b> indium 49	50 <b>Sn</b> tin 50	51 <b>Sb</b> antimony 51	52 <b>Te</b> tellurium 52	53 <b>I</b> iodine 53	54 <b>Xe</b> xenon 54	55 <b>Cs</b> caesium 55	56 <b>Ba</b> barium 56	57 <b>La*</b> lanthanum 57	58 <b>Ce*</b> cerium 58	59 <b>Pr*</b> praseodymium 59	60 <b>Nd*</b> neodymium 60	61 <b>Pm*</b> promethium 61	62 <b>Sm*</b> samarium 62	63 <b>Eu*</b> europium 63	64 <b>Gd*</b> gadolinium 64	65 <b>Tb*</b> terbium 65	66 <b>Dy*</b> dysprosium 66	67 <b>Ho*</b> holmium 67	68 <b>Er*</b> erbium 68	69 <b>Tm*</b> thulium 69	70 <b>Yb*</b> ytterbium 70	71 <b>Lu*</b> lutetium 71	72 <b>Hf</b> hafnium 72	73 <b>Ta</b> tantalum 73	74 <b>W</b> tungsten 74	75 <b>Re</b> rhenium 75	76 <b>Os</b> osmium 76	77 <b>Ir</b> iridium 77	78 <b>Pt</b> platinum 78	79 <b>Au</b> gold 79	80 <b>Hg</b> mercury 80	81 <b>Tl</b> thallium 81	82 <b>Pb</b> lead 82	83 <b>Bi</b> bismuth 83	84 <b>Po</b> polonium 84	85 <b>At</b> astatine 85	86 <b>Rn</b> radon 86	87 <b>Fr</b> francium 87	88 <b>Ra</b> radium 88	89 <b>Ac*</b> actinium 89	90 <b>Th*</b> thorium 90	91 <b>Pa*</b> protactinium 91	92 <b>U*</b> uranium 92	93 <b>Np*</b> neptunium 93	94 <b>Pu*</b> plutonium 94	95 <b>Am*</b> americium 95	96 <b>Cm*</b> curium 96	97 <b>Bk*</b> berkelium 97	98 <b>Cf*</b> californium 98	99 <b>Es*</b> einsteinium 99	100 <b>Fm*</b> fermium 100	101 <b>Mendelevium</b> 101	102 <b>Nobelium</b> 102	103 <b>Lr*</b> lawrencium 103	104 <b>Rf</b> rutherfordium 104	105 <b>Db</b> dubnium 105	106 <b>Sg</b> seaborgium 106	107 <b>Bh</b> bohrium 107	108 <b>Hs</b> hassium 108	109 <b>Mt</b> meitnerium 109	110 <b>Ds</b> darmstadtium 110	111 <b>Rg</b> roentgenium 111	112 <b>Cn</b> copernicium 112	113 <b>Nh</b> nihonium 113	114 <b>Fl</b> flerovium 114	115 <b>Mc</b> moscovium 115	116 <b>Lv</b> livermorium 116	117 <b>Ts</b> tennessine 117	118 <b>Og</b> oganesson 118	119 <b>Uue</b> unbinilium 119	120 <b>Uub</b> unbibium 120	121 <b>Uut</b> untrium 121	122 <b>Uuq</b> unquadium 122	123 <b>Uuh</b> unhexium 123	124 <b>Uus</b> unseptium 124	125 <b>Uuo</b> unoctium 125	126 <b>Uuh</b> unheptium 126	127 <b>Uus</b> unseptium 127	128 <b>Uuo</b> unoctium 128	129 <b>Uuh</b> unheptium 129	130 <b>Uus</b> unseptium 130	131 <b>Uuo</b> unoctium 131	132 <b>Uuh</b> unheptium 132	133 <b>Uus</b> unseptium 133	134 <b>Uuo</b> unoctium 134	135 <b>Uuh</b> unheptium 135	136 <b>Uus</b> unseptium 136	137 <b>Uuo</b> unoctium 137	138 <b>Uuh</b> unheptium 138	139 <b>Uus</b> unseptium 139	140 <b>Uuo</b> unoctium 140	141 <b>Uuh</b> unheptium 141	142 <b>Uus</b> unseptium 142	143 <b>Uuo</b> unoctium 143	144 <b>Uuh</b> unheptium 144	145 <b>Uus</b> unseptium 145	146 <b>Uuo</b> unoctium 146	147 <b>Uuh</b> unheptium 147	148 <b>Uus</b> unseptium 148	149 <b>Uuo</b> unoctium 149	150 <b>Uuh</b> unheptium 150	151 <b>Uus</b> unseptium 151	152 <b>Uuo</b> unoctium 152	153 <b>Uuh</b> unheptium 153	154 <b>Uus</b> unseptium 154	155 <b>Uuo</b> unoctium 155	156 <b>Uuh</b> unheptium 156	157 <b>Uus</b> unseptium 157	158 <b>Uuo</b> unoctium 158	159 <b>Uuh</b> unheptium 159	160 <b>Uus</b> unseptium 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unoctium 299	300 <b>Uuh</b> unheptium 300	301 <b>Uus</b> unseptium 301	302 <b>Uuo</b> unoctium 302	303 <b>Uuh</b> unheptium 303	304 <b>Uus</b> unseptium 304	305 <b>Uuo</b> unoctium 305	306 <b>Uuh</b> unheptium 306	307 <b>Uus</b> unseptium 307	308 <b>Uuo</b> unoctium 308	309 <b>Uuh</b> unheptium 309	310 <b>Uus</b> unseptium 310	311 <b>Uuo</b> unoctium 311	312 <b>Uuh</b> unheptium 312	313 <b>Uus</b> unseptium 313	314 <b>Uuo</b> unoctium 314	315 <b>Uuh</b> unheptium 315	316 <b>Uus</b> unseptium 316	317 <b>Uuo</b> unoctium 317	318 <b>Uuh</b> unheptium 318	319 <b>Uus</b> unseptium 319	320 <b>Uuo</b> unoctium 320	321 <b>Uuh</b> unheptium 321	322 <b>Uus</b> unseptium 322	323 <b>Uuo</b> unoctium 323	324 <b>Uuh</b> unheptium 324	325 <b>Uus</b> unseptium 325	326 <b>Uuo</b> unoctium 326	327 <b>Uuh</b> unheptium 327	328 <b>Uus</b> unseptium 328	329 <b>Uuo</b> unoctium 329	330 <b>Uuh</b> unheptium 330	331 <b>Uus</b> unseptium 331	332 <b>Uuo</b> unoctium 332	333 <b>Uuh</b> unheptium 333	334 <b>Uus</b> unseptium 334	335 <b>Uuo</b> unoctium 335	336 <b>Uuh</b> unheptium 336	337 <b>Uus</b> unseptium 337	338 <b>Uuo</b> unoctium 338	339 <b>Uuh</b> unheptium 339	340 <b>Uus</b> unseptium 340	341 <b>Uuo</b> unoctium 341	342 <b>Uuh</b> unheptium 342	343 <b>Uus</b> unseptium 343	344 <b>Uuo</b> unoctium 344	345 <b>Uuh</b> unheptium 345	346 <b>Uus</b> unseptium 346	347 <b>Uuo</b> unoctium 347	348 <b>Uuh</b> unheptium 348	349 <b>Uus</b> unseptium 349	350 <b>Uuo</b> unoctium 350	351 <b>Uuh</b> unheptium 351	352 <b>Uus</b> unseptium 352	353 <b>Uuo</b> unoctium 353	354 <b>Uuh</b> unheptium 354	355 <b>Uus</b> unseptium 355	356 <b>Uuo</b> unoctium 356	357 <b>Uuh</b> unheptium 357	358 <b>Uus</b> unseptium 358	359 <b>Uuo</b> unoctium 359	360 <b>Uuh</b> unheptium 360	361 <b>Uus</b> unseptium 361	362 <b>Uuo</b> unoctium 362	363 <b>Uuh</b> unheptium 363	364 <b>Uus</b> unseptium 364	365 <b>Uuo</b> unoctium 365	366 <b>Uuh</b> unheptium 366	367 <b>Uus</b> unseptium 367	368 <b>Uuo</b> unoctium 368	369 <b>Uuh</b> unheptium 369	370 <b>Uus</b> unseptium 370	371 <b>Uuo</b> unoctium 371	372 <b>Uuh</b> unheptium 372	373 <b>Uus</b> unseptium 373	374 <b>Uuo</b> unoctium 374	375 <b>Uuh</b> unheptium 375	376 <b>Uus</b> unseptium 376	377 <b>Uuo</b> unoctium 377	378 <b>Uuh</b> unheptium 378	379 <b>Uus</b> unseptium 379	380 <b>Uuo</b> unoctium 380	381 <b>Uuh</b> unheptium 381	382 <b>Uus</b> unseptium 382	383 <b>Uuo</b> unoctium 383	384 <b>Uuh</b> unheptium 384	385 <b>Uus</b> unseptium 385	386 <b>Uuo</b> unoctium 386	387 <b>Uuh</b> unheptium 387	388 <b>Uus</b> unseptium 388	389 <b>Uuo</b> unoctium 389	390 <b>Uuh</b> unheptium 390	391 <b>Uus</b> unseptium 391	392 <b>Uuo</b> unoctium 392	393 <b>Uuh</b> unheptium 393	394 <b>Uus</b> unseptium 394	395 <b>Uuo</b> unoctium 395	396 <b>Uuh</b> unheptium 396	397 <b>Uus</b> unseptium 397	398 <b>Uuo</b> unoctium 398	399 <b>Uuh</b> unheptium 399	400 <b>Uus</b> unseptium 400	401 <b>Uuo</b> unoctium 401	402 <b>Uuh</b> unheptium 402	403 <b>Uus</b> unseptium 403	404 <b>Uuo</b> unoctium 404	405 <b>Uuh</b> unheptium 405	406 <b>Uus</b> unseptium 406	407 <b>Uuo</b> unoctium 407	408 <b>Uuh</b> unheptium 408	409 <b>Uus</b> unseptium 409	410 <b>Uuo</b> unoctium 410	411 <b>Uuh</b> unheptium 411	412 <b>Uus</b> unseptium 412	413 <b>Uuo</b> unoctium 413	414 <b>Uuh</b> unheptium 414	415 <b>Uus</b> unseptium 415	416 <b>Uuo</b> unoctium 416	417 <b>Uuh</b> unheptium 417	418 <b>Uus</b> unseptium 418	419 <b>Uuo</b> unoctium 419	420 <b>Uuh</b> unheptium 420	421 <b>Uus</b> unseptium 421	422 <b>Uuo</b> unoctium 422	423 <b>Uuh</b> unheptium 423	424 <b>Uus</b> unseptium 424	425 <b>Uuo</b> unoctium 425	426 <b>Uuh</b> unheptium 426	427 <b>Uus</b> unseptium 427	428 <b>Uuo</b> unoctium 428	429 <b>Uuh</b> unheptium 429	430 <b>Uus</b> unseptium 430	431 <b>Uuo</b> unoctium 431	432 <b>Uuh</b> unheptium 432	433 <b>Uus</b> unseptium 433	434 <b>Uuo</b> unoctium 434	435 <b>Uuh</b> unheptium 435	436 <b>Uus</b> unseptium 436	437 <b>Uuo</b> unoctium 437	438 <b>Uuh</b> unheptium 438	439 <b>Uus</b> unseptium 439	440 <b>Uuo</b> unoctium 440	441 <b>Uuh</b> unheptium 441	442 <b>Uus</b> unseptium 442	443 <b>Uuo</b> unoctium 443	444 <b>Uuh</b> unheptium 444	445 <b>Uus</b> unseptium 445	446 <b>Uuo</b> unoctium 446	447 <b>Uuh</b> unheptium 447	448 <b>Uus</b> unseptium 448	449 <b>Uuo</b> unoctium 449	450 <b>Uuh</b> unheptium 450	451 <b>Uus</b> unseptium 451	452 <b>Uuo</b> unoctium 452	453 <b>Uuh</b> unheptium 453	454 <b>Uus</b> unseptium 454	455 <b>Uuo</b> unoctium 455	456 <b>Uuh</b> unheptium 456	457 <b>Uus</b> unseptium 457	458 <b>Uuo</b> unoctium 458	459 <b>Uuh</b> unheptium 459	460 <b>Uus</b> unseptium 460	461 <b>Uuo</b> unoctium 461	462 <b>Uuh</b> unheptium 462	463 <b>Uus</b> unseptium 463	464 <b>Uuo</b> unoctium 464	465 <b>Uuh</b> unheptium 465	466 <b>Uus</b> unseptium 466	467 <b>Uuo</b> unoctium 467	468 <b>Uuh</b> unheptium 468	469 <b>Uus</b> unseptium 469	470 <b>U</b>