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East Spring Secondary School
Towards Excellence and Success

Name: _____ ()

Class: _____

Second Semester Examinations 2017 Secondary Two Express

SCIENCE

6 October 2017
Friday

2 hours
0745 - 0945

Additional Materials:
OTAS

INSTRUCTIONS TO CANDIDATES

1. Write your name, class and register number in the spaces provided on the question paper.

2. Section A (30 marks).
Answer **all** questions. Record your answer in 2B soft pencil on the OTAS.
Read the instructions on the OTAS.

Section B (30 marks)
Answer **all** questions.
Write the answers in the spaces provided.

Section C (40 marks)
Answer C1 and any of the remaining **three** questions in the spaces provided. **C1 is a compulsory question.**

3. A copy of the periodic table is found on Page 29.
4. Hand up the OTAS separately from the rest of the paper.
5. The number of marks is given in brackets [] at the end of each question or part question.
6. Calculators are allowed.

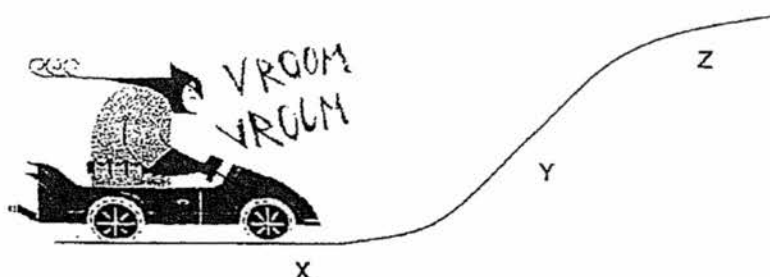
Section	Marks
A	30
B	30
C	40
Total	100

This question paper consists of 29 printed pages including the cover page.

Section A (30 marks)

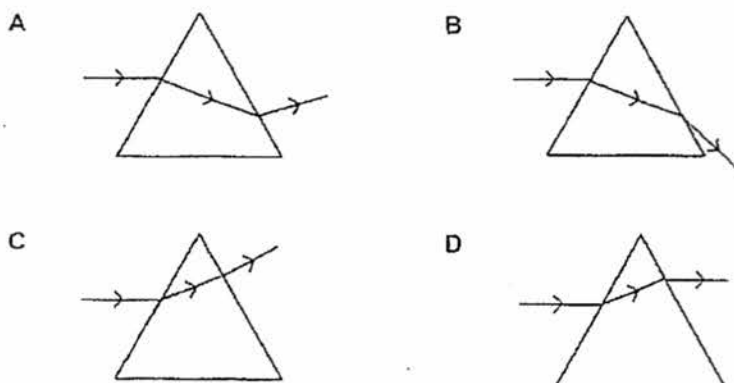
Answer all questions. Shade all your answers on the OTAS sheet provided.

- A1 Batman drives his Batmobile up the slope and comes to rest at point Z as shown in the figure below.

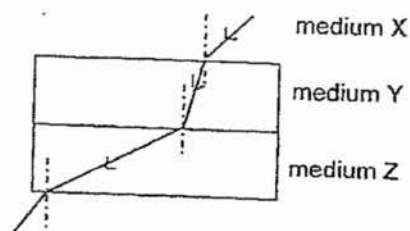


Assuming no energy is lost to the surroundings, what can you say about the energy possessed by Batman and his Batmobile?

- A The kinetic energy at Y is less than that at X.
 - B The gravitational potential energy at X is the greatest.
 - C The gravitational potential energy is always equal to the kinetic energy.
 - D The total energy at Z is equal to the total energy at X.
- A2 Which of the following shows that there is no work done?
- A Dragging a box across the floor.
 - B Kicking a ball towards a goalpost.
 - C Leaning against a concrete wall.
 - D Throwing a ball up into the air.
- A3 Which of the following correctly illustrates the path of a light ray travelling from air through the glass prism?

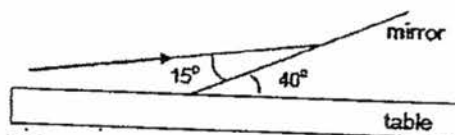


- A4 A ray of light passes through three different mediums, X, Y and Z.



Which shows the correct order of increasing optical density of the three mediums?

- A X, Y, Z
 B X, Z, Y
 C Y, X, Z
 D Z, X, Y
- A5 A mirror is tilted at an angle of 40° to the table. A ray of light is directed so that it hits the mirror at an angle of 15° to the surface of the mirror.



Which one of the following correctly identifies the angles of incidence and reflection?

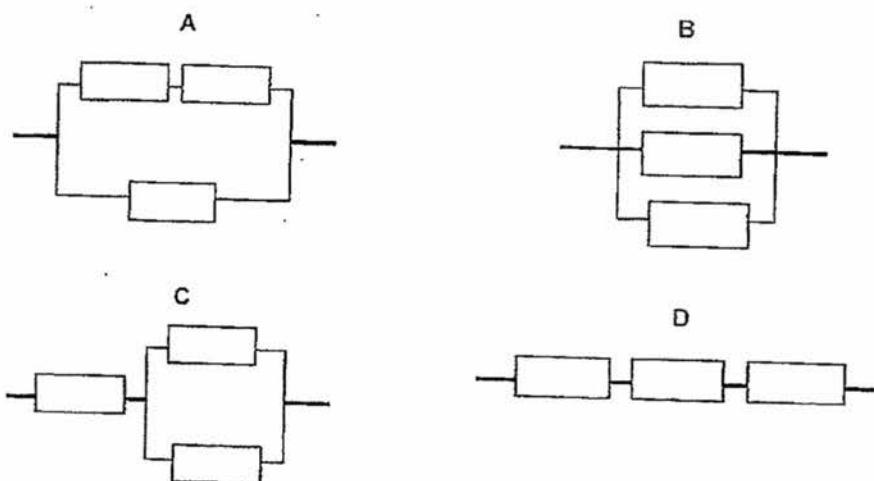
	angle of incidence	angle of reflection
A	15°	15°
B	40°	40°
C	55°	55°
D	75°	75°

- A6 A 200 W bulb is switched on for 30 minutes. How many minutes does a 1 kW toaster take to use the same amount of energy as the bulb?

- A 6
 B 60
 C 100
 D 360

5

- A9 Three identical resistors can be connected in different ways. Which connection will give the largest total resistance?



- A10 Given that a hair dryer uses 0.6 A, what would be the current in each of the wires when the hair dryer is turned on under normal working condition?

	earth wire	neutral wire	live wire
A	0 A	0.6 A	0.6 A
B	0 A	0 A	0.6 A
C	0.6 A	0.6 A	0 A
D	0.6 A	0 A	0 A

- A11 The melting and boiling points of four unknown substances are given below. Which of the following substances, A, B, C or D, have particles vibrating about their fixed positions at room temperature?

	melting point / °C	boiling point / °C
A	- 102	- 25
B	- 27	74
C	6	92
D	87	259

- A12** The boiling points of various gases found in air are shown below.

gas	boiling point / °C
argon	- 186
nitrogen	- 198
xenon	- 108
oxygen	- 183

If the air is cooled, the first substance to condense is water vapour.

If the temperature is decreased further, what is the next gas to condense?

- A argon
C nitrogen
- B xenon
D oxygen

- A13** A molecule has the formula $\text{C}_3\text{H}_7\text{COOCa}$.
How many elements and atoms are present in the molecule?

	number of elements	number of atoms
A	4	14
B	4	15
C	5	14
D	5	15

- A14. An element is represented by the symbol ${}^{83}_{36}\text{X}$.

What does the nucleus of this element contain?

- A 36 electrons and 47 neutrons
B 36 neutrons and 83 protons
C 36 protons and 47 neutrons
D 37 protons and 83 neutrons

- A15 The table below shows some information about particles Q and R.

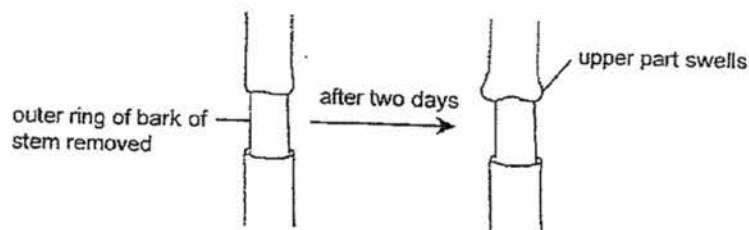
	protons	neutrons	electrons
Q	16	16	18
R	17	18	18

What are Q and R?

- A Negative ions of different elements
B Negative ions of the same element
C Positive ions of different elements
D Positive ions of the same element

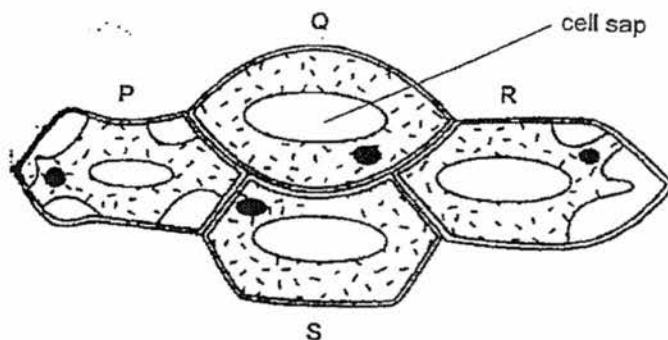
7

A16 Study the diagram below.



Why did the upper part of the bark swell?

- A Water carried by phloem cannot go further downwards and gets accumulated there.
 - B There is pressure exerted due to the xylem transporting water up the stem against gravity.
 - C Water from roots passes through the xylem and gets accumulated there.
 - D Food that is produced by the leaves and carried by the phloem cannot go downwards and gets accumulated there.
- A17 The diagram below shows four plant cells, P, Q, R and S, in contact with each other. The cell sap in the middle of each cell contains water. The size of the cell sap indicates the water potential in the cell.

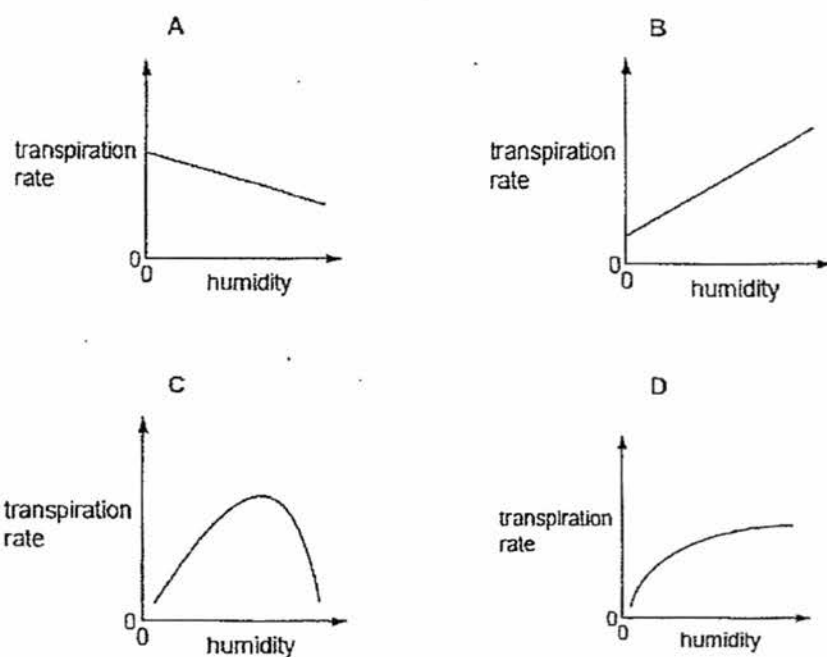


If the cells remain in contact as shown for the next 30 minutes, how will water move by osmosis among the plant cells?

- | | | | |
|---|-------------------|---|-------------------|
| A | P to Q and R to S | B | Q to P and S to R |
| C | Q to S and S to R | D | R to Q and Q to P |

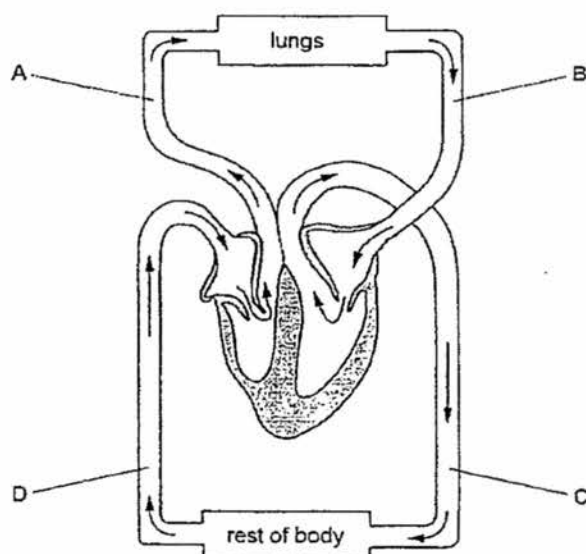
8

A18 Which graph shows the effect of increasing humidity on the transpiration rate of a plant?



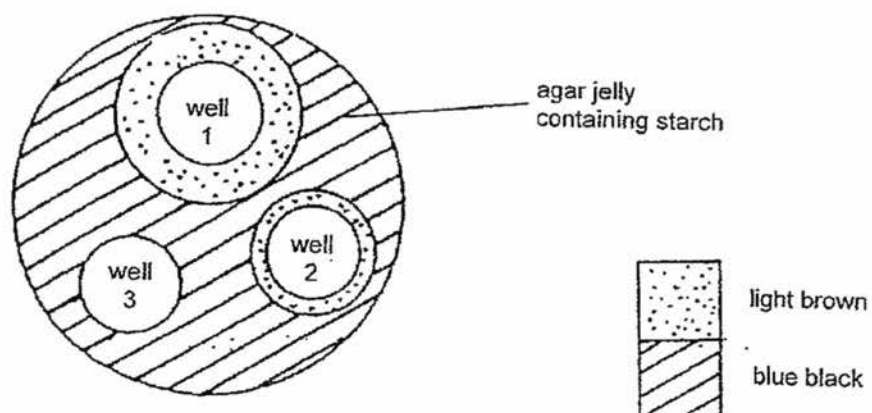
A19 The diagram below shows the circulatory system.

In which vessel is the blood pressure highest?



- A20 Which substance is **not** transported by plasma in blood?
- A amino acids
C oxygen
- B glucose
D waste products
- A21 Which of the following does **not** involve the chemical breakdown of food substances in the alimentary canal?
- A mouth
C small intestine
- B oesophagus
D stomach
- A22 Agar jelly containing starch was set in a shallow dish. Three similar wells were cut out of the jelly and a 1 cm³ volume of untreated amylase, boiled amylase and acidified amylase was placed in each well.

After 12 hours, the jelly was covered with iodine solution, and the results were shown in the diagram below.

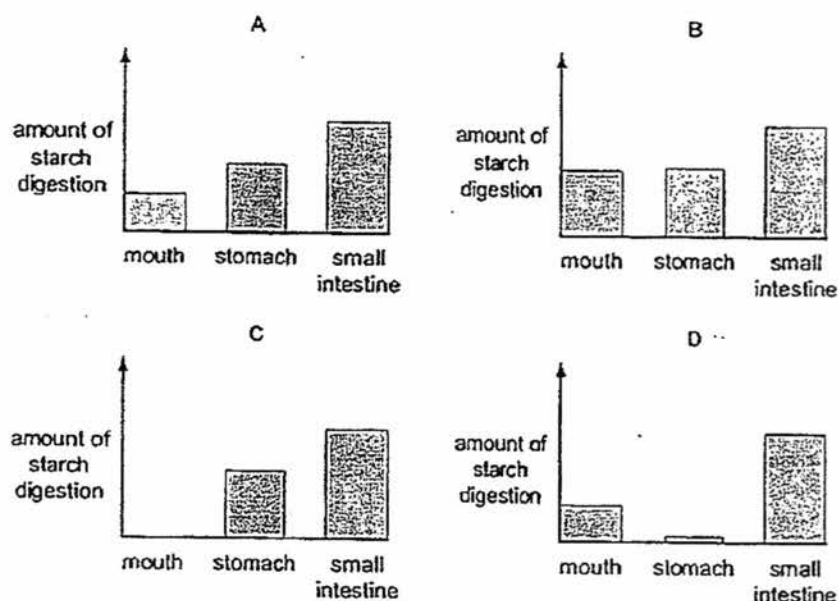


Which of the following correctly identifies the solutions which were placed in the wells?

	well 1	well 2	well 3
A	acidified amylase	boiled amylase	untreated amylase
B	acidified amylase	untreated amylase	boiled amylase
C	boiled amylase	acidified amylase	untreated amylase
D	untreated amylase	acidified amylase	boiled amylase

10

- A23 Which bar chart correctly shows the amount of starch digestion in the mouth, stomach and small intestine?



- A24 The nutrition information of two food substances, X and Y, are shown in the table below.

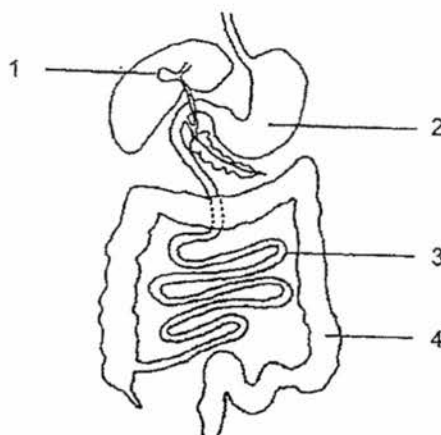
food substance	nutritional value per 100g	
X	Carbohydrate	25.5g
	Protein	0.08g
	Fat	9.1g
Y	Carbohydrate	47g
	Protein	3.0g
	Fat	14.5g

Which of the following are the main products of digestion of X and Y?

- A fatty acids and amino acids
- B glycerol and amino acids
- C glucose and fatty acids
- D glucose and amino acids

11

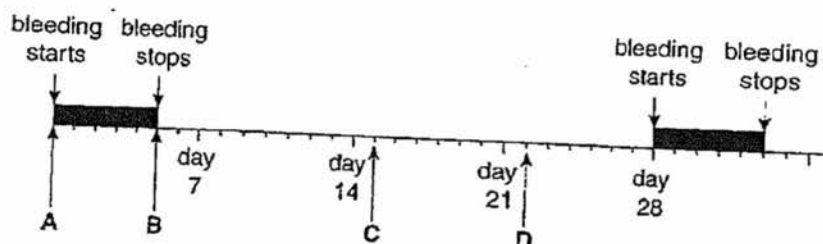
A25 The diagram below shows a section of the human digestive system.



In which organ does protein digestion start and end?

	organ where protein digestion starts	organ where protein digestion ends
A	1	3
B	1	4
C	2	3
D	2	4

A26 The diagram below shows the menstrual cycle of a lady. At which period of the menstrual cycle is the uterus lining the thinnest?

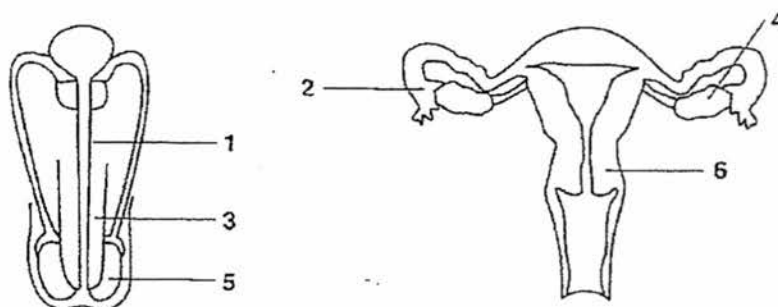


A27 AIDS and syphilis are both sexually transmitted infections (STIs). Which of the following correctly compares the two STIs?

- A Syphilis can be treated with antibiotics but AIDS cannot.
- B AIDS can be inherited genetically by the baby but syphilis cannot.
- C Both are caused by viruses.
- D Both syphilis and AIDS attack the immune system of the infected.

12

A28 The diagrams below show the male and female reproductive systems.



Which of the structures are involved in bringing about puberty changes in male and female?

- | | | | |
|---|---------|---|---------|
| A | 1 and 6 | B | 2 and 5 |
| C | 3 and 4 | D | 4 and 5 |

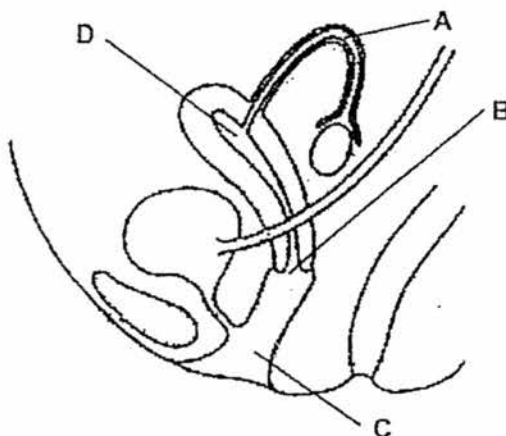
A29 The various stages in human reproduction are listed below.

- I Contraction of the muscles of the uterus to push out the baby.
- II Development of embryo into foetus in the uterus.
- III Fertilised egg moves along the fallopian tube.
- IV Fusion of the nuclei of a sperm and an egg.
- V Implantation of embryo to the thickened lining of uterus.

Which of the following lists the correct sequence of the stages in human reproduction?

- | | |
|---|-------------------|
| A | III, I, II, IV, V |
| B | III, IV, II, I, V |
| C | IV, III, V, II, I |
| D | IV, V, II, III, I |

A30 The diagram below shows part of the female reproductive system. Where should the diaphragm be placed as part of birth control?



Section B (30 marks)

Answer ALL the questions in the spaces provided.

- B1 Table B1.1 gives some information on three particles which are represented by the letters X, Y and Z. The letters do not represent the atomic symbol of any of the elements.

particle	number of electrons	number of neutrons	number of protons
X	10	12	12
Y	6	6	6
Z	10	14	13

Table B1.1

- (a) "X is an ion, not an atom".

Use information from Table B1.1 to justify the above statement.

[1]

.....

.....

- (b) State the charge on particle X.

[1]

.....

- (c) Draw and state the electronic structure of particle Y in the space provided.

electronic configuration of particle Y:

[2]

- B2 The archer fish has a unique way of catching its prey. It shoots a jet of water upwards to knock off insects from low branches. The prey then falls into the water and is eaten up by the archer fish as shown in Figure B2.1.

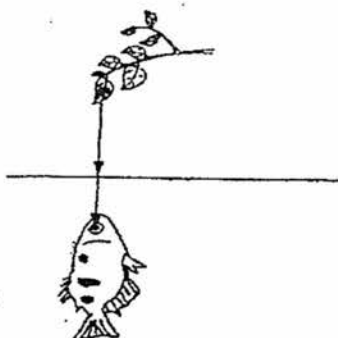


Figure B2.1

- (a) Using your understanding of the refraction of light, explain why the fish always shoots from a position directly underneath its prey. [3]

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- (b) An optician's test panel is located 30 cm behind the eyes of a patient who looks into a plane mirror 250 cm in front of him, as shown in Figure B2.2.

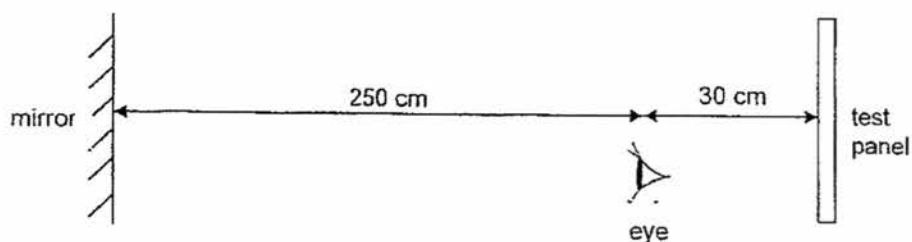


Figure B2.2

Calculate the distance of the image of the test panel in the mirror from the patient's eyes.

[2]

15

- B3 Figure B3.1 shows a circuit made up of five resistors connected to an ammeter and a battery with a voltage of 15 V.

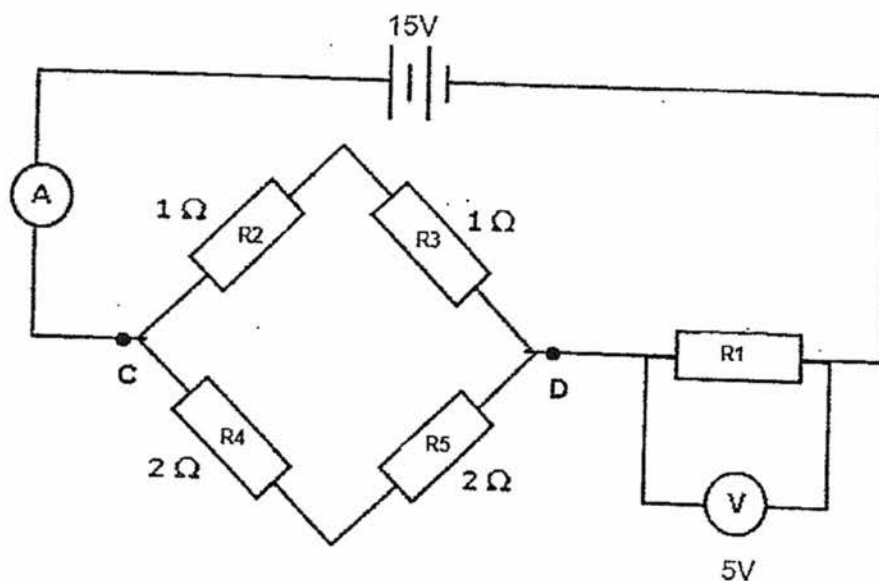


Figure B3.1

- (a) State the potential difference across points C to D. [1]
- (b) Calculate the current flowing through R2 and R3. [1]
- (c) Calculate the current flowing through R4 and R5. [1]
- (d) Hence, calculate the reading of the ammeter. [1]

(e) Calculate the resistance of R1. [1]

(f) Suggest a suitable fuse rating for the entire circuit. [1]

B4 Table B4.1 shows the data of two types of blood vessels found in the human body.

blood vessel	diameter of lumen (mm)	oxygen content (%)
A	2.0	80
B	4.0	2

Table B4.1

(a) Identify blood vessels A and B. [1]

A: B:

(b) State two other differences between blood vessels A and B.. [2]

.....

.....

.....

(c) A doctor would like to draw some blood from a vein of a patient for a blood test. [1]
Explain why the doctor should draw the blood from the vein.

.....

.....

.....

- B5 Ordinary washing powder does not remove egg stains from clothes easily. These stains, however, can be removed by biological washing powder. Table B5.1 shows some information given on a packet of biological washing powder.

Ingredients	
• Protease	0.2%
• Detergent	15%
Directions	
• Soak clothes in a solution of washing powder for several hours before washing.	
• Do not use water at temperature over 60°C	
Caution	
• Do not use on silk and wool.	
• Rinse your hands well after contact with this product.	

Table B5.1

- (a) Explain why this biological washing powder can remove egg stains from clothes more effectively than normal washing powder. [1]
-
-
- (b) Suggest and explain a way to shorten the soaking time for the clothes. [2]
-
-
- (c) Explain why it is not advisable to use this powder with water at temperature above 60°C? [1]
-
-
- (d) Suggest why this washing powder should not be used on silk and wool. [1]
-
-

B6 (a) Figure B6.1 shows the human female reproductive system.

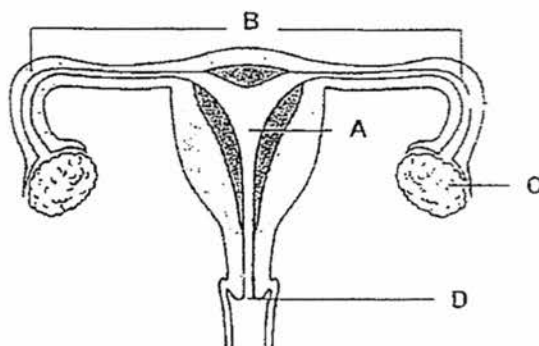


Figure B6.1

(i) Name the labelled structures. [2]

A: B:

C: D:

(ii) State two functions of part A after fertilisation has occurred. [2]

.....

.....

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(b) An infection in part B results in them being completely blocked. Explain why a woman with the infection will not be able to become pregnant. [2]

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End of Section B

Section C (40 marks)

Answer C1 and any other three questions in the spaces provided.

- C1 Circuits X and Y are both open circuits. The inlet of solution A and solution B can accept equal volumes of solution into their respective compartments, separated by a partially permeable membrane, which is then tightly sealed.

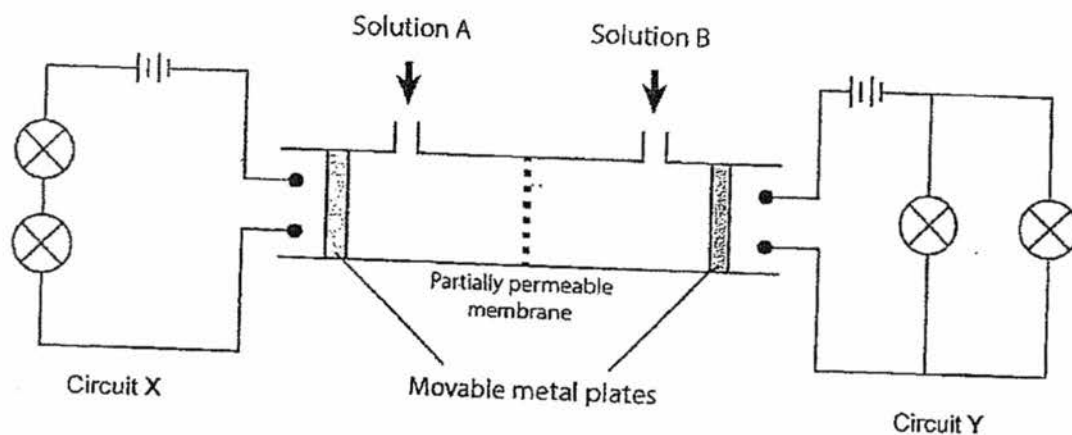


Figure C1.1

- (a) Given that the light bulbs in circuits X and Y are all identical and each have a resistance of $2\ \Omega$,

- (i) calculate the total effective resistance in circuit X;

[1]

- (ii) calculate total effective resistance in circuit Y.

[1]

- (b) Xiao Hui was given two solutions, pure water and 50% salt solution. She would like to switch on one of the circuits where the lightbulbs would to shine the brightest. State which combination of solutions would allow her to achieve her goal.

[2]

Solution A should be

Solution B should be

- (c) With reference to Figure C1.1 and your answer in (a), explain your answer to part (b).

[4]

This image shows a full page of primary-ruled paper. It features ten sets of horizontal lines. Each set consists of a solid top line, a dashed middle line, and a solid bottom line, providing a guide for letter height and placement. The paper is otherwise blank, with no text or markings.

- (d) Suggest one way to increase the brightness of the bulbs in the set up in Figure C1.1.

[1]

.....

- (e) State one safety precaution Xiao Hui should take when she conducts the experiment.

[1]

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 100 101 102 103 104 105 106 107 108 109 110 111 112 113 114 115 116 117 118 119 120 121 122 123 124 125 126 127 128 129 130 131 132 133 134 135 136 137 138 139 140 141 142 143 144 145 146 147 148 149 150 151 152 153 154 155 156 157 158 159 160 161 162 163 164 165 166 167 168 169 170 171 172 173 174 175 176 177 178 179 180 181 182 183 184 185 186 187 188 189 190 191 192 193 194 195 196 197 198 199 200 201 202 203 204 205 206 207 208 209 210 211 212 213 214 215 216 217 218 219 220 221 222 223 224 225 226 227 228 229 230 231 232 233 234 235 236 237 238 239 240 241 242 243 244 245 246 247 248 249 250 251 252 253 254 255 256 257 258 259 260 261 262 263 264 265 266 267 268 269 270 271 272 273 274 275 276 277 278 279 280 281 282 283 284 285 286 287 288 289 290 291 292 293 294 295 296 297 298 299 300 301 302 303 304 305 306 307 308 309 310 311 312 313 314 315 316 317 318 319 320 321 322 323 324 325 326 327 328 329 330 331 332 333 334 335 336 337 338 339 340 341 342 343 344 345 346 347 348 349 350 351 352 353 354 355 356 357 358 359 360 361 362 363 364 365 366 367 368 369 370 371 372 373 374 375 376 377 378 379 380 381 382 383 384 385 386 387 388 389 390 391 392 393 394 395 396 397 398 399 400 401 402 403 404 405 406 407 408 409 410 411 412 413 414 415 416 417 418 419 420 421 422 423 424 425 426 427 428 429 430 431 432 433 434 435 436 437 438 439 440 441 442 443 444 445 446 447 448 449 450 451 452 453 454 455 456 457 458 459 460 461 462 463 464 465 466 467 468 469 470 471 472 473 474 475 476 477 478 479 480 481 482 483 484 485 486 487 488 489 490 491 492 493 494 495 496 497 498 499 500 501 502 503 504 505 506 507 508 509 510 511 512 513 514 515 516 517 518 519 520 521 522 523 524 525 526 527 528 529 530 531 532 533 534 535 536 537 538 539 540 541 542 543 544 545 546 547 548 549 550 551 552 553 554 555 556 557 558 559 560 561 562 563 564 565 566 567 568 569 570 571 572 573 574 575 576 577 578 579 580 581 582 583 584 585 586 587 588 589 590 591 592 593 594 595 596 597 598 599 600 601 602 603 604 605 606 607 608 609 610 611 612 613 614 615 616 617 618 619 620 621 622 623 624 625 626 627 628 629 630 631 632 633 634 635 636 637 638 639 640 641 642 643 644 645 646 647 648 649 650 651 652 653 654 655 656 657 658 659 660 661 662 663 664 665 666 667 668 669 670 671 672 673 674 675 676 677 678 679 680 681 682 683 684 685 686 687 688 689 690 691 692 693 694 695 696 697 698 699 700 701 702 703 704 705 706 707 708 709 710 711 712 713 714 715 716 717 718 719 720 721 722 723 724 725 726 727 728 729 730 731 732 733 734 735 736 737 738 739 740 741 742 743 744 745 746 747 748 749 750 751 752 753 754 755 756 757 758 759 760 761 762 763 764 765 766 767 768 769 770 771 772 773 774 775 776 777 778 779 780 781 782 783 784 785 786 787 788 789 790 791 792 793 794 795 796 797 798 799 800 801 802 803 804 805 806 807 808 809 810 811 812 813 814 815 816 817 818 819 820 821 822 823 824 825 826 827 828 829 830 831 832 833 834 835 836 837 838 839 840 841 842 843 844 845 846 847 848 849 850 851 852 853 854 855 856 857 858 859 860 861 862 863 864 865 866 867 868 869 870 871 872 873 874 875 876 877 878 879 880 881 882 883 884 885 886 887 888 889 890 891 892 893 894 895 896 897 898 899 900 901 902 903 904 905 906 907 908 909 910 911 912 913 914 915 916 917 918 919 920 921 922 923 924 925 926 927 928 929 930 931 932 933 934 935 936 937 938 939 940 941 942 943 944 945 946 947 948 949 950 951 952 953 954 955 956 957 958 959 960 961 962 963 964 965 966 967 968 969 970 971 972 973 974 975 976 977 978 979 980 981 982 983 984 985 986 987 988 989 990 991 992 993 994 995 996 997 998 999 1000 1001 1002 1003 1004 1005 1006 1007 1008 1009 1010 1011 1012 1013 1014 1015 1016 1017 1018 1019 1020 1021 1022 1023 1024 1025 1026 1027 1028 1029 1030 1031 1032 1033 1034 1035 1036 1037 1038 1039 1040 1

- C2 During the hotter months in Singapore, restaurants see an increased number of customers ordering iced water.



- (a) With reference to the Particulate Nature of Matter,

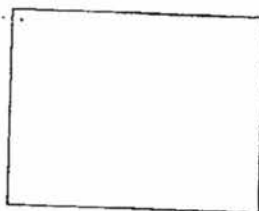
- (i) describe the differences between ice and water in terms of the movement of molecules. [2]

.....

.....

.....

- (ii) draw a diagram to show the arrangement of particles in the water. [1]



- (b) When water freezes into ice, the temperature remains unchanged during the freezing process.

Tom thinks that it is because "the water molecules gained energy and forces of attraction between molecules became weaker."

Correct Tom's statement above.

[1]

.....

.....

- (c) A molecule of a substance is made of an unknown element X, hydrogen and carbon. Its chemical formula is shown below:



One molecule of this substance has a total number of 32 protons.

- (i) Determine the number of protons in one atom of element X. [2]
-
- (ii) Hence, with reference to the Periodic Table, give the identity of element X. [1]
-
- (iii) Explain why this substance is a molecule of a compound. [1]
-
-
- (d) Table C2.1 table shows the atomic structures of four particles that are represented by the letter A to D. The particles can be atoms or ions. The letters are **not** the symbols of the elements.

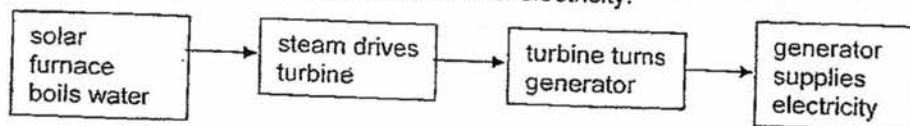
particle	no. of electrons	no. of protons	no. of neutrons
A	2	2	2
B	6	6	6
C	12	12	12
D	6	6	8

Table C2.1

Use the letters A to D to answer the following questions.

- (i) State the particle which belongs to an element from Group II. [1]
-
- (ii) State the particle that can be represented as $^{12}_6\text{C}$. [1]
-

- C3 (a) A solar power station is designed for use in desert countries. The flow chart below shows the steps involved in the production of electricity.



The solar furnace consists of many concave mirrors as shown in Figure C3.1.

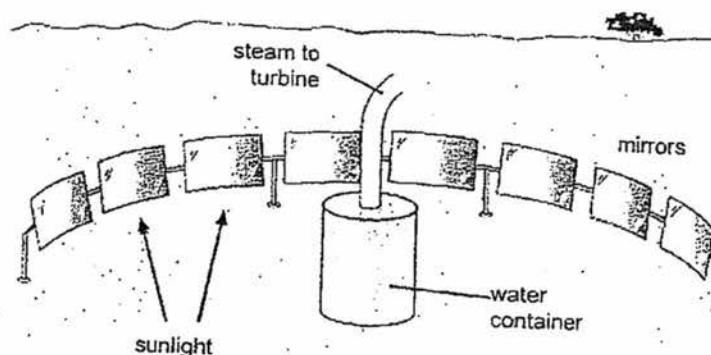


Figure C3.1

- (i) State the purpose of the mirrors and explain their arrangement in the generation of electricity.

[2]

- (ii) Using the Particulate Nature of Matter, describe the changes in energy, arrangement and movement of water particles when water is heated to steam in the process of electricity generation.

[3]

24

- (b) State **two** energy conversions that take place in the entire process of electricity generation.

[2]

.....

.....

- (c) Figure C3.2 shows two blocks of apartments on each side of a road. A beam of light from a helicopter is hitting the top window H of the block of apartment on the left.

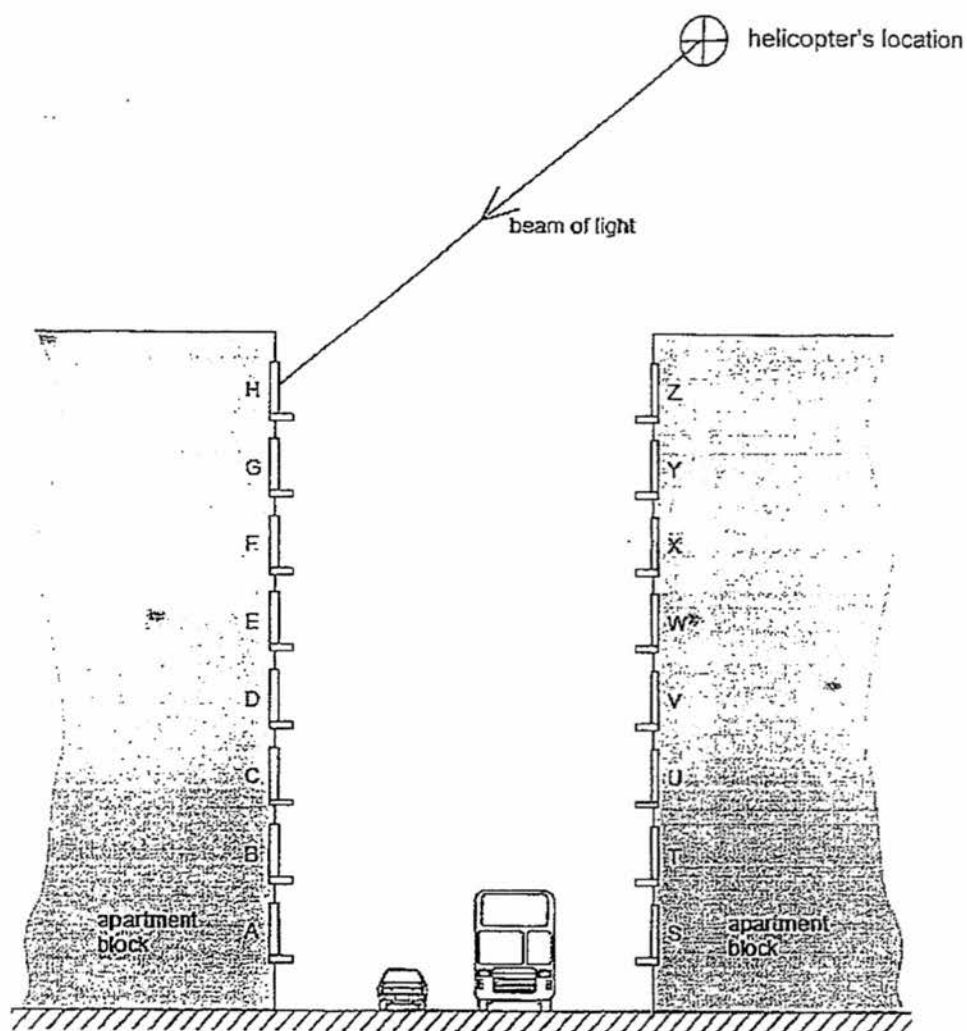


Figure C3.2

Complete Figure C3.2 above with the following:

- (i) the normal at the point where the beam hits window H. [1]
- (ii) the angle of reflection (r) at the point where the beam hits window H. [1]

(iii) Identify the window at which the light beam will hit next.

[1]

- C4 A scientist measured the amount of starch, fats and proteins in a meal taken by Amy, and recorded the results (in grams) in column V of Table C4.1. He then measured the remaining amounts of starch, fats and proteins at the end of every digestive organ, and recorded the results in columns W - Z of Table C4.1.

	V	W	X	Y	Z
nutrient	initial amount in meal / g	mouth / g	oesophagus / g	stomach / g	small intestine / g
starch	2	1.5	1.5		0
protein	15	15	15		0
fats	5	5	5		0

Table C4.1

- (a) State two reasons why humans need food.

[2]

- (b) The scientist lost his results for column Y, that show the amounts of starch, protein and fats present at the end of digestion in the stomach.

[2]

Complete column Y of Table C4.1 with the possible results (in grams) for each nutrient.

- (c) Explain the change in amounts of starch from the mouth to the end of the small intestine.

[3]

- (d) Describe and explain how the small intestine is adapted to carry out the absorption of food nutrients effectively. [3]

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- C5 (a) The charts in Figure C5.1 show how the thickness of the uterine lining of two women change over the months of September and October.

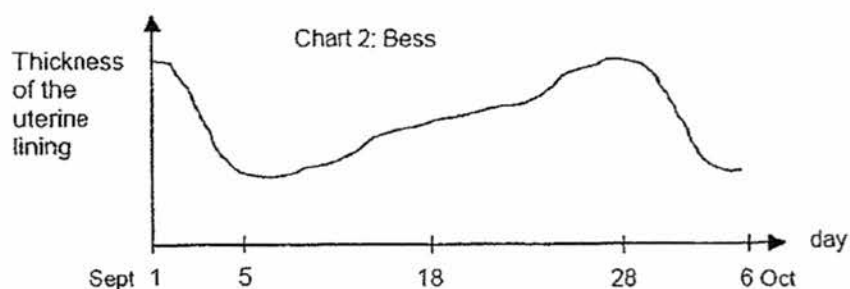
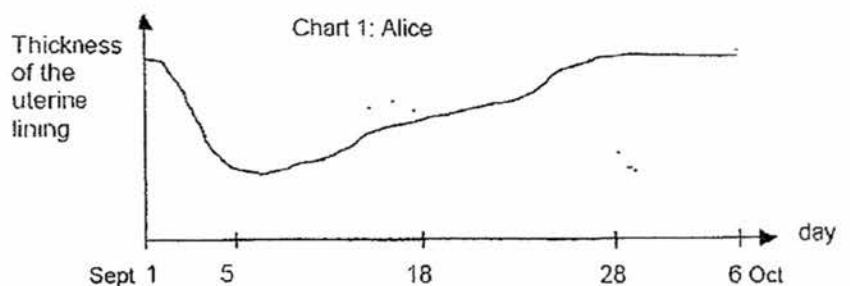


Figure C5.1

27

- (i) One of the charts shows that fertilisation has taken place. Identify the woman who has gotten pregnant and explain your answer. [2]

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Both Alice and Bess have a 28-day menstrual cycle and ovulated on 14 September.

- (ii) State the first day of the next menstrual cycle for the woman who did not get pregnant. [1]

.....

- (iii) If the woman in b(ii) also wants to conceive, she needs to be aware of her fertile period. State her fertile period in October according to Figure C5.1. [1]

.....

- (iv) State one advantage for a woman to use tubal ligation as a form of contraception as compared to using a diaphragm. [1]

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- (b) Figure C5.2 shows the male reproductive system.

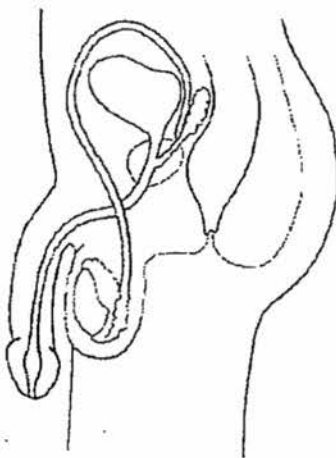


Figure C5.2

- (i) Label the urethra, sperm duct and testis on Figure C5.2. [3]

(ii) State the function of the scrotum.

[1]

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.....

(iii) Suggest a reason why a man's sperm count can be affected when he uses his laptop on his lap for a prolonged period of time.

[1]

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.....

End of Paper

The Periodic Table of Elements

Group																	
I	II											III	IV	V	VI	VII	0
3 Li lithium 7	4 Be beryllium 9											5 B boron 11	6 C carbon 12	7 N nitrogen 14	8 O oxygen 16	9 F fluorine 19	10 Ne neon 20
11 Na sodium 23	12 Mg magnesium 24											13 Al aluminum 27	14 Si silicon 28	15 P phosphorus 31	16 S sulfur 32	17 Cl chlorine 35.5	18 Ar argon 40
19 K potassium 39	20 Ca calcium 40	21 Sc scandium 45	22 Ti titanium 48	23 V vanadium 51	24 Cr chromium 52	25 Mn manganese 55	26 Fe iron 56	27 Co cobalt 59	28 Ni nickel 59	29 Cu copper 64	30 Zn zinc 65	31 Ga gallium 70	32 Ge germanium 73	33 As arsenic 75	34 Se selenium 79	35 Br bromine 80	36 Kr krypton 84
37 Rb rubidium 85	38 Sr strontium 88	39 Y yttrium 89	40 Zr zirconium 91	41 Nb niobium 93	42 Mo molybdenum 96	43 Tc technetium 98	44 Ru ruthenium 101	45 Rh rhodium 103	46 Pd palladium 106	47 Ag silver 108	48 Cd cadmium 112	49 In indium 115	50 Sn tin 119	51 Sb antimony 122	52 Te tellurium 128	53 I iodine 127	54 Xe xenon 131
55 Cs cesium 133	56 Ba barium 137	57-71 lanthanoids	72 Hf hafnium 178	73 Ta tantalum 181	74 W tungsten 184	75 Re rhenium 186	76 Os osmium 190	77 Ir iridium 192	78 Pt platinum 195	79 Au gold 197	80 Hg mercury 201	81 Tl thallium 204	82 Pb lead 207	83 Bi bismuth 209	84 Po polonium 209	85 At astatine 210	86 Rn radon 222
87 Fr francium 223	88 Ra radium 226	89-103 actinoids	104 Rf rutherfordium 261	105 Db dubnium 262	106 Sg seaborgium 266	107 Bh bohrium 264	108 Hs hassium 277	109 Mt meitnerium 268	110 Ds darmstadtium 271	111 Rg roentgenium 272	112 Cn copernicium 285	113 Nh nihonium 286	114 Fl flerovium 289	115 Lv livermorium 293	116 Uu ununoctium 294	117 Ts tennessine 294	118 Og oganesson 294

lanthanoids

actinoids

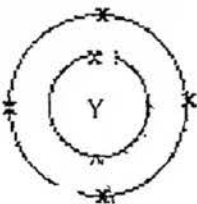
The volume of one mole of any gas is 24 dm³ at room temperature and pressure (r.t.p.).

East Spring Secondary School
Sec 2E Science
2017 2SE
Marking Scheme

Section A (30m)

1	2	3	4	5	6	7	8	9	10
D	C	B	D	D	A	D	C	D	A
11	12	13	14	15	16	17	18	19	20
D	B	A	C	A	D	B	A	C	C
21	22	23	24	25	26	27	28	29	30
B	D	D	C	C	B	A	D	C	B

Section B (30m)

B1	(a)	X has <u>2 more protons than electrons</u> , making it <u>positively charged</u> .	1
	(b)	The charge is 2+	1
	(c)	Electronic configuration of particle Y = 2,4 	1 for ec 1 for drawing
(Total: 4)			

B2	(a)	Light ray entering the fish's eyes is <u>along / coincides with the normal to the water surface</u> has an <u>angle of incidence of zero</u> , and the light ray <u>does not bend/refract</u> . Fish's aim will be accurate as it <u>sees the actual position of the insect</u> and not the apparent position had refraction occur.	1 1 1
	(b)	Image distance = 30 cm + 250 cm + 250 cm = 530 cm	M1 A1
Total: 5			

B3	(a)	p.d. across CD = $15 - 5 = 10 \text{ V}$	1
	(b)	$I = V/R$ $= 10 / (1+1)$ $= 5 \text{ A}$	1
	(c)	$I = V/R$ $= 10 / (2+2)$ $= 2.5 \text{ A}$	1
	(d)	Total current through ammeter = $5 + 2.5 = 7.5 \text{ A}$	1
	(e)	$R = V/I$ $= 5 / 7.5$ $= 0.667 \Omega \text{ (3 sf)}$	1
	(f)	8 A	1
		Total: 6	

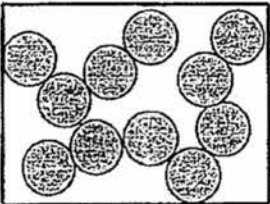
B4	(a)	A: artery B: vein	1
	(b)	- A has a <u>thicker muscular wall</u> as compared to B. - A <u>does not contain valves</u> , while B <u>contains valves</u> - A <u>transports blood away from heart</u> to rest of body, while B <u>transports blood from body to heart</u> . - Blood flows through A at <u>higher pressure</u> while blood flows through B at <u>lower pressure</u> Any 2 Students cannot state size of lumen and oxygen content (qn asks for OTHER differences)	1 1
	(c)	<u>Blood pressure is lower in veins</u> as compared to arteries thus there is a less chance of blood vessel bursting/blood squirting when blood is taken from veins.	1
		Total: 4	

B5	(a)	It contains <u>protease</u> that can <u>digest/break down proteins</u> in the egg stain	1
	(b)	Use <u>warm water</u> to soak the clothes as <u>enzyme activity increases in higher temperature</u> . OR use more washing powder [1] as it will increase the concentration of enzyme to remove the stain faster [1].	1 1
	(c)	The enzyme will be <u>denatured</u> .	1
	(d)	Wool and silk are <u>made of proteins</u> which will be <u>destroyed by protease</u> .	1
		Total: 5	

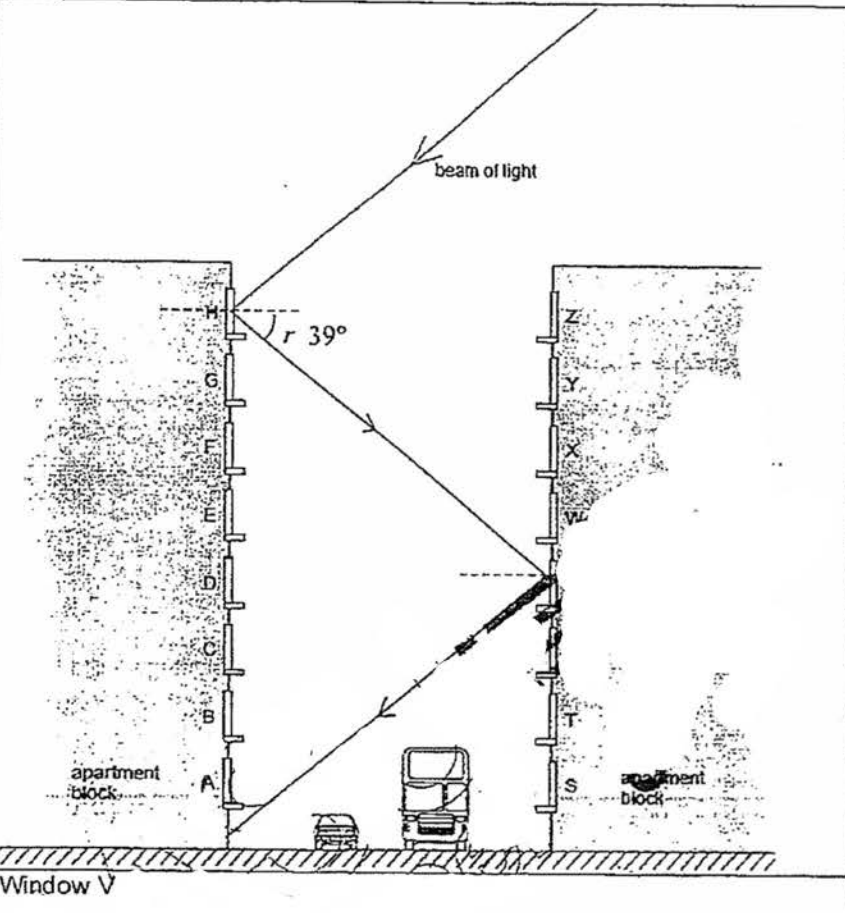
B6	(ai)	A – uterus B – oviduct/fallopian tube C – ovary D – cervix	4c-2m 2-3c-1m 0-1c-0m
	(aii)	Uterus is the site of <u>implantation</u> of embryo. Uterus is the site where <u>foetus grows/ develops/ provide nutrients and oxygen</u> to foetus.	1 1
	(b)	Blockage of the oviduct will <u>prevent the sperms entering the vagina</u> to come into <u>contact</u> with the mature ovum in the <u>oviduct</u> released from the ovary. Hence <u>fertilisation will not be able to / cannot take place/ occur</u> . Reject: ovum unable to move to uterus to be fertilised by sperm	1 1
		Total: 6	

Section C (40m)

C1	(ai)	$R_T \text{ Circuit X} = 2 + 2 = 4 \Omega$	1
	(aii)	$R_T \text{ Circuit Y} = \frac{1}{\frac{1}{2} + \frac{1}{2}} = 1 \Omega$	1
	(b)	A: pure water B: 50% salt solution	1 1
	(c)	Water has higher water potential than 50% salt solution. Water molecules will <u>move</u> from region of <u>higher water potential</u> (X) to region of <u>lower water potential</u> [1] (Y) via <u>osmosis</u> [1], across the <u>partially permeable membrane</u> [1]. Circuit Y has <u>lower resistance</u> than circuit X [1], hence this set up will make the lightbulbs the brightest	
	(d)	<u>Remove</u> 1 bulb from circuit X	1
	(e)	She <u>should not touch the circuit with wet hands</u> as she may get electric shock.	1

C2	(ai)	In <u>ice</u> , molecules are <u>vibrating about their fixed positions</u> [1], while in <u>water</u> , molecules are <u>sliding past one another in a random manner</u> [1]	2
	(aii)		1
	(b)	The water molecules <u>lose</u> energy and forces of attraction between molecules became <u>stronger</u> .	1

	(ci)	Total no. of protons = $(6 \times 2) + 4 + 2x = 32$ $x = (32 - 16) / 2 = 8$ <u>protons</u>	M1 A1
	(cii)	Oxygen	1
	(ciii)	It is made up of <u>3 different elements chemically combined together</u>	1
	(di)	C	1
	(dii)	B	1
C3	(a)(i)	To <u>reflect</u> sunlight to the container To <u>concentrate/converge the light</u> energy to the container in the middle This provides heat energy needed to boil the water to produce steam. (light energy to heat energy to boil the water)	1 1
	(a)(ii)	- When the temperature increases, the particles <u>gain Kinetic energy/Kinetic energy increases</u> Movement: from <u>sliding past one another randomly</u> to <u>moving at high speeds randomly</u> . - Arrangement: from <u>closely packed in disorderly manner</u> to <u>far apart in a random manner</u> .	1 4c-2 2-3c-1 0-1c-0
	(b)	heat energy $\rightarrow$ kinetic energy [1] OR light + heat energy $\rightarrow$ kinetic energy kinetic energy $\rightarrow$ electrical energy [1]	1 1

(ci) (cii)		1m – normal 1m – reflected ray and angle r .
(ciii)	Window V	1

C4 (a)

Humans need food to provide them with energy to do work/
 To maintain a healthy body/
 Grow new cells and tissues/
 Repair worn-out tissues

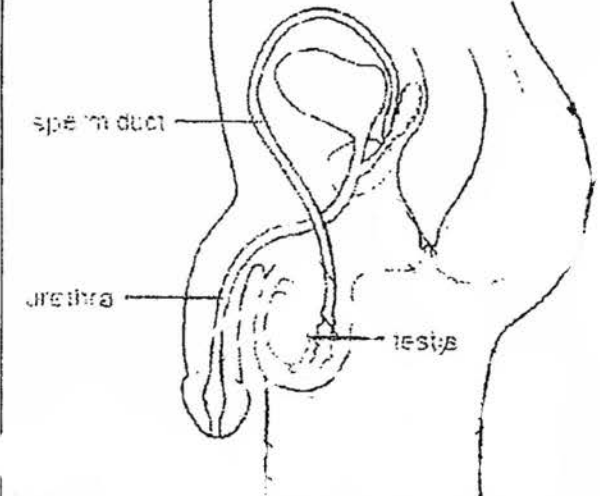
(Any 2)

(b)

3c-2 / 1-2c-1 / 0c-0

	V	W	X	Y	Z
nutrient	initial amounts in meal / g	mouth / g	oesophagus / g	stomach / g	small intestine / g
starch	2	1.5	1.5	1.5g	0
protein	15	15	15	<15g, >0g (Any amount within the range)	0
fat	5	5	5	5g	0

	(c)	<u>Starch is broken down by amylase to form maltose in the mouth.</u> <u>Starch is also broken down by amylase to form maltose in the small intestine.</u> <u>Maltose is then broken down by maltase to form glucose in the small intestine.</u> <u>The glucose is then absorbed in the small intestine.</u> (Any 3)(Need not be in sequence)	3
	(d)	- <u>villi</u> are present to provide a <u>larger surface area for faster absorption</u> of digested food molecules - small intestine is <u>long and coiled, increasing surface area for faster absorption.</u> - Wall of small intestine is <u>one-celled thick</u>, shortening distance between wall and blood vessels so that <u>absorption can be faster</u> - <u>Constant flow of blood</u> ensures low concentration of food in capillary, so <u>rate of diffusion</u> of digested food molecules into bloodstream is <u>increased</u>. → Any 3 → Student must describe adaptation and explain its function to get the mark → Award 1 mark if student only states adaptations without giving explanation	3
C5	(ai)	Alice has <u>conceived</u>: [1] Chart shows that the <u>thickness of uterine lining remained constant/continued to thicken</u> after 28 Sept. [1]	2
	(aii)	29 Sept (+/- 2days)	1
	(aiii)	9 Oct to 15 Oct	1
	(aiv)	Tubal ligation is <u>more reliable/ more effective</u> than using diaphragm as it is a <u>permanent</u> birth control method	1

(bi)		1M each label
(bii)	A protective bag/sac which <u>holds the testes outside the body</u> to keep them cooler / at lower temperature than the body temperature.	1
(biii)	Prolonged use of the laptop on the lap <u>produces heat</u> which can <u>raise the temperature of the testes</u> , affecting the normal production of <u>sperms</u> by the testes Reject: kills sperms	1