Name: ..... Reg. No. ..... Class: .....

Founded 1842

St.Margaret's Secondary School

Mid-Year Examination 2012

LOWER SECONDARY SCIENCE

Secondary Two Express
Paper 1 (30 marks)

9 May 2012
Duration: 2 Hours (For both Papers 1 and 2)
Total Marks: 100 (For both Papers 1 and 2)

Additional Material: OTAS

READ THESE INSTRUCTIONS FIRST

Do not open this Booklet until you are told to do so.

You may start with either Paper 1 or Paper 2.

Write your name, index number and class on the OTAS sheet and in the spaces provided on this page.
Answer all 30 questions in this paper.
For each question, there are four possible answers, A, B, C and D. Choose the one you consider correct and shade your choice of answer on the OTAS sheet provided, with a soft 2B pencil.

Erase unwanted answers thoroughly from the answer sheet.

Each correct answer will score one mark.

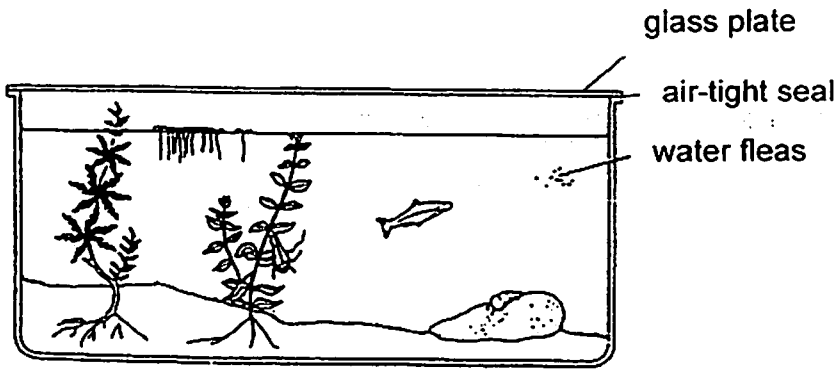
Calculators are allowed in this paper.

A copy of the Periodic Table has been printed on Page 14 of this paper.

This question paper consists of 14 printed pages.

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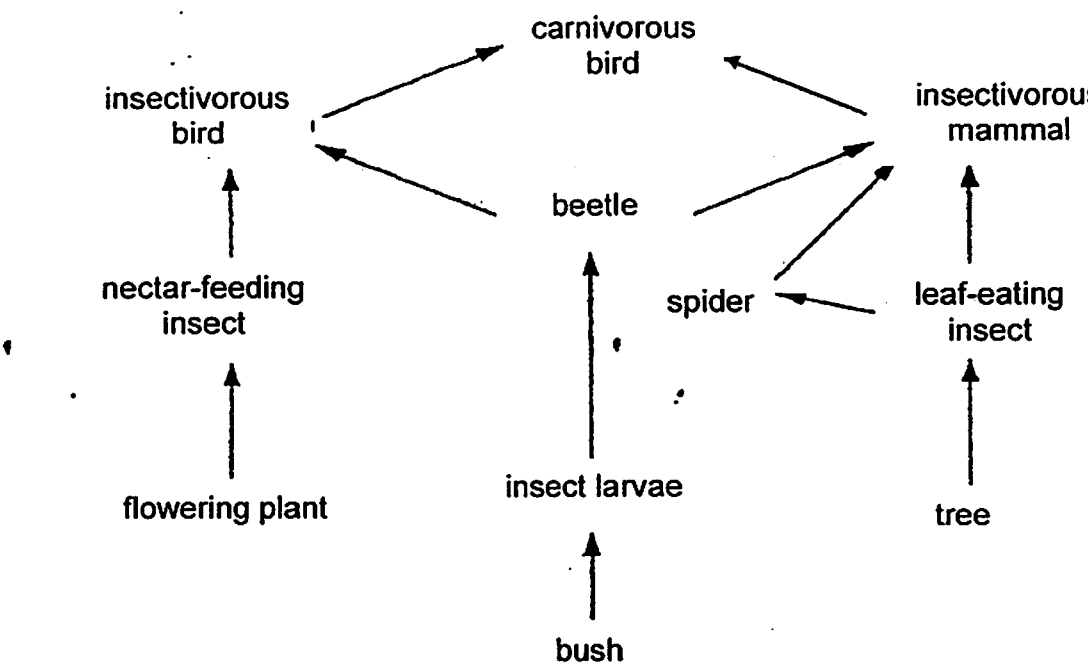
1. The figure below shows some organisms sealed in an aquarium.



What must be provided to keep the organisms alive for the longest possible time?

A Carbon dioxide
B Light energy
C Mineral salts
D Oxygen

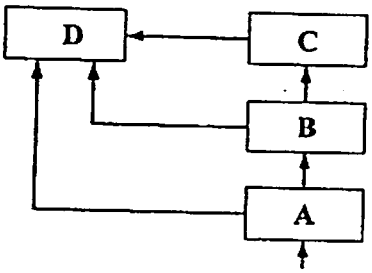
2. The diagram below shows part of a food web. Which organisms can be considered as secondary as well as tertiary consumers?



A Insectivorous bird and beetle
B Insectivorous mammal and beetle
C Insectivorous bird and insectivorous mammal
D Insectivorous bird and carnivorous bird

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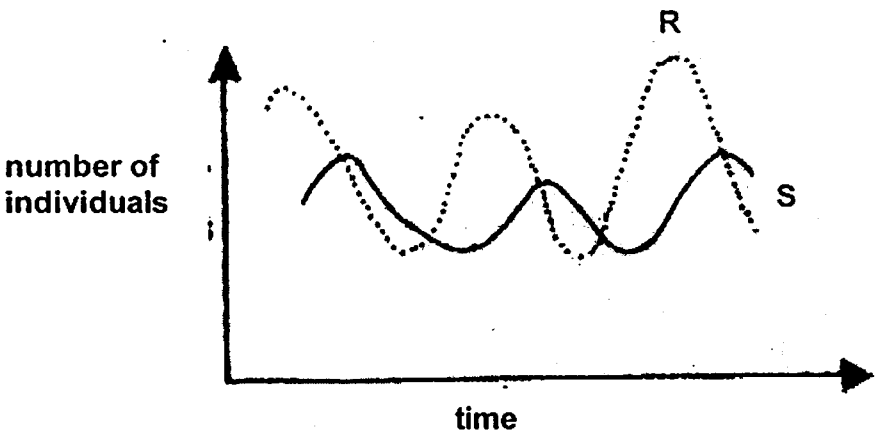
Questions 3 and 4 refer to the diagram below which represents the flow of energy in a typical ecosystem.



3. Which box represents the decomposers?

4. Which box represents the largest total biomass of living organisms?

5. On the graph below, the two curves represent the number of two different organisms R and S in the same food chain.

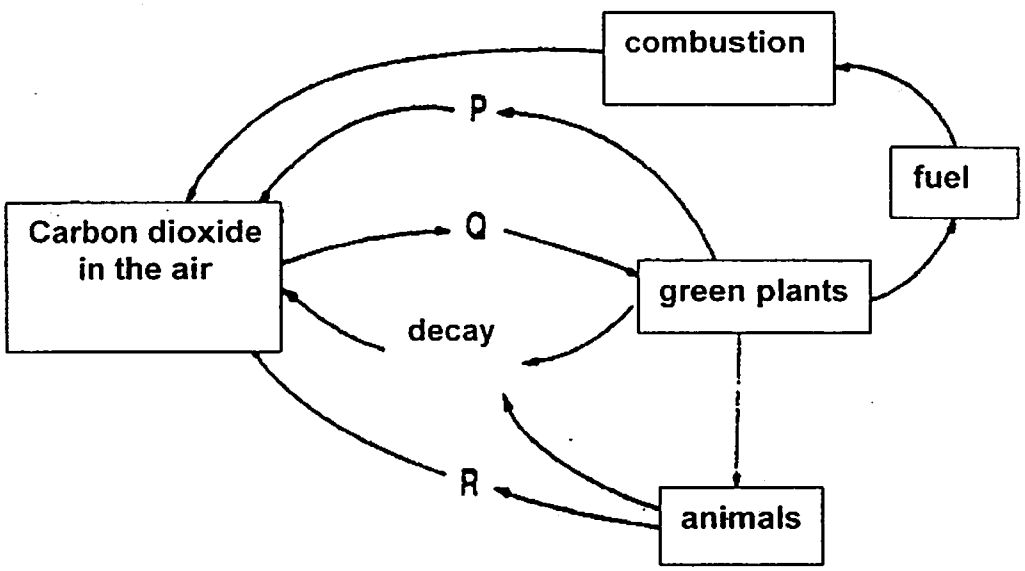


What do R and S represent?

	R	S
A	Producer	Predator
B	Primary consumer	Producer
C	Secondary consumer	Producer
D	Primary consumer	Secondary consumer

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6. The diagram below represents the carbon cycle.

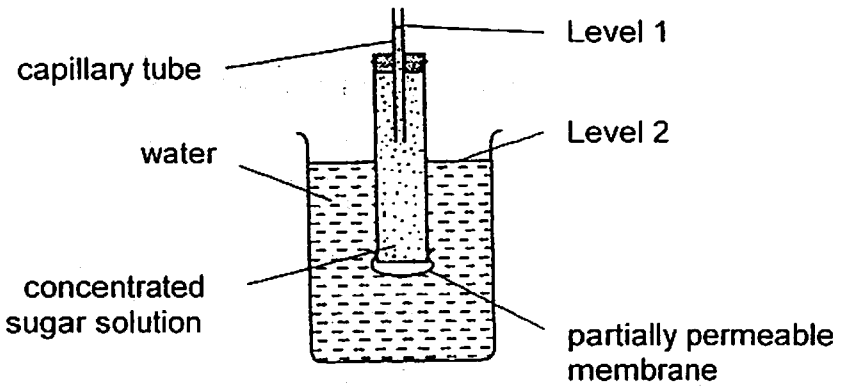


What are processes **P**, **Q** and **R**?

	P	Q	R
A	Photosynthesis	Respiration	Photosynthesis
B	Photosynthesis	Respiration	Respiration
C	Respiration	Photosynthesis	Respiration
D	Respiration	Photosynthesis	Decomposition

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7. The diagram shows an apparatus used to investigate osmosis.



After 4 hours, which changes in liquid levels will occur and which molecules will move across the partially permeable membrane?

	Level 1	Level 2	Molecules that move
A	Decrease	Increase	Sugar
B	Decrease	Increase	Water
C	Increase	Decrease	Sugar
D	Increase	Decrease	Water

8. A Visking tubing containing a starch suspension and pink food dye is lowered into a beaker of water. Which of the following will occur as a result of diffusion?

I The water in the beaker will turn pink.
II The Visking tubing will shrink as water leaves it.
III The Visking tubing will swell as water enters it.
IV The Visking tubing will shrink as starch leaves it.

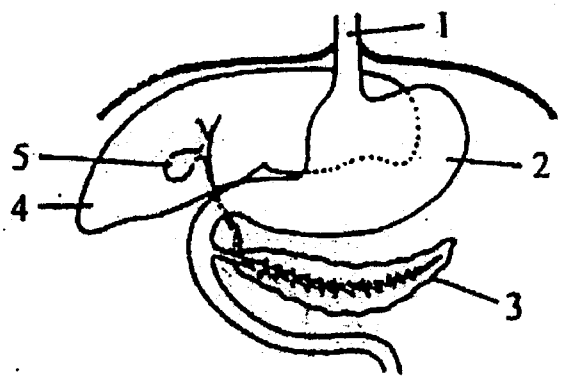
A I only
B II only
C I and III
D I and IV

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9. A human red blood cell is placed in distilled water.
In which direction will water move and what is the effect on the red blood cell?

	Movement of water	Effect on the cell
A	Into the cell	Slight increase in size
B	Into the cell	Bursts
C	Out of the cell	Slight decrease in size
D	Out of the cell	Bursts

10. The figure shows part of the human alimentary canal. Which two structures produce substances involved in the digestion of fats?



A (1) and (2)
B (1) and (5)
C (2) and (3)
D (3) and (4)

11. What would happen if a person's gall bladder is removed?

A Carbohydrate digestion would be reduced.
B Fat digestion would be reduced.
C Fat digestion would stop.
D Protein digestion be reduced.

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12. The secretions below are all active in the human alimentary canal.

(1) Saliva
(2) Gastric juice
(3) Bile
(4) Pancreatic juice
(5) Intestinal juice

Which of these secretions contain the enzyme amylase?

A (1) only
B (1) and (4) only
C (1) and (5) only
D (2) and (5) only

13. The table shows the protein, fat and carbohydrate content in 10 g of rice and steamed fish.

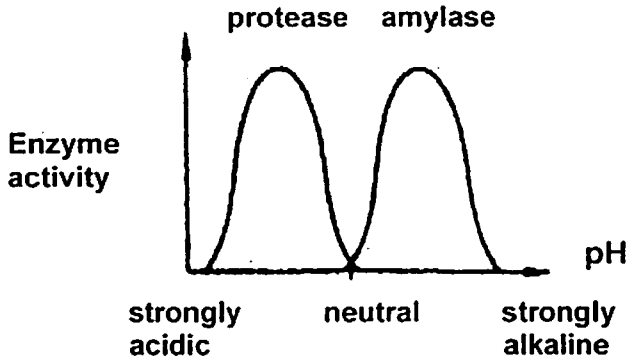
Food	Protein / g	Fat / g	Carbohydrate / g
Fish	1.6	0.005	0.0
Rice	0.6	0.1	8.7

What would be the main end-products of digestion of a meal of rice and steamed fish?

A Amino acids and simple sugars
B Amino acids and glycerol
C Simple sugars and fatty acids
D Simple sugars and glycerol

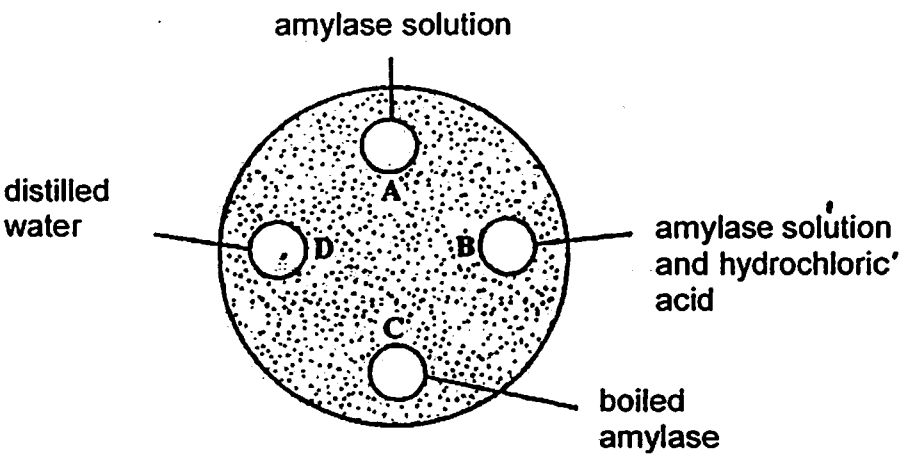
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14. The diagram shows the effect of pH on the activity of two enzymes in the human digestive system. In which regions of the alimentary canal would the enzymes be most active?



	Protease	Amylase
A	Large intestine	Stomach
B	Small intestine	Large intestine
C	Stomach	Small intestine
D	Stomach	Large intestine

15. A dish was prepared with agar jelly containing starch. Four holes were cut out in the jelly and each hole was filled with substances as shown in the diagram below.
(Note: The amylase used is from the mouth.)



After 30 minutes, iodine solution was poured over the jelly. Which hole will be surrounded by the largest yellow-brown region?

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16. At room temperature (30°C), mercury is a liquid while iron is a solid.
Which of the following statements about mercury and iron is correct?

A Mercury particles have more kinetic energy than iron particles.
B Iron particles have more kinetic energy than mercury particles.
C The melting point of mercury is higher than room temperature.
D The melting point of iron is lower than the melting point of mercury.

17. Which of the following statements correctly explains why solids cannot be compressed?

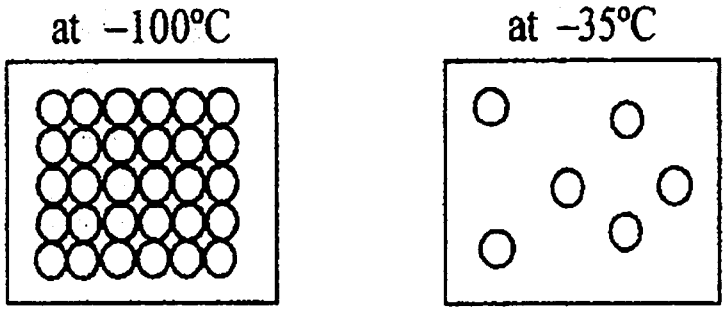
A The forces of attraction between the particles in solids are very strong.
B The particles in solids are not vibrating enough.
C The particles in solids are very closely packed together.
D The particles in solids are in fixed positions.

18. Which of the following correctly describes 'condensation'?

A As gas molecules lose energy to the surroundings, they move further apart, and the substance changes into the liquid state.
B As gas molecules lose energy to the cool surface they come in contact with, they move closer together, and the substance changes into the liquid state.
C As gas molecules gain energy from the warm surface they come in contact with, they move faster until they collide, causing the substance to change into the liquid state.
D As gas molecules gain energy from the surroundings, they move closer together and the substance changes into the liquid state.

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19. The diagram shows the arrangement of particles in a substance at two different temperatures, -100°C and -35°C.



Which substance could the diagrams represent?

Substance	Melting point /°C	Boiling point /°C
A	-92	-39
B	-102	-45
C	-94	-20
D	-169	-104

20. Ammonium sulfate is a compound used in fertilisers and has the chemical formula $(NH_4)_2SO_4$.
How many elements and atoms does it have?

	Elements	Atoms
A	4	15
B	4	14
C	3	10
D	3	7

21. Which one of the following lists shows a mixture of two elements and two compounds?

A Ar, O_2, N_2 and He
B H_2, O_2, N_2 and CO_2
C H_2O, CO_2, NH_3 and O_2
D O_2, N_2, CO_2 and H_2O

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22. Which of the following pairs of atoms have the same number of neutrons?

A $^{15}_{7}X$ and $^{14}_{7}Y$
B $^{23}_{11}X$ and $^{23}_{12}Y$
C $^{14}_{6}X$ and $^{16}_{8}Y$
D $^{235}_{92}X$ and $^{238}_{92}Y$

23. Which one of the following ions has the most shells that contain electrons?

A Al^{3+}
B N^{3-}
C Li^{+}
D S^{2-}

24. What is the atomic structure of the ion of Z in which Z^{2+} has a proton number of 38 and a nucleon number of 88?

A 36 electrons, 38 protons and 88 neutrons
B 36 electrons, 38 protons and 50 neutrons
C 38 electrons, 40 protons and 50 neutrons
D 38 electrons, 40 protons and 88 neutrons

25. A paper clip is placed in front of a plane mirror as shown in the diagram.

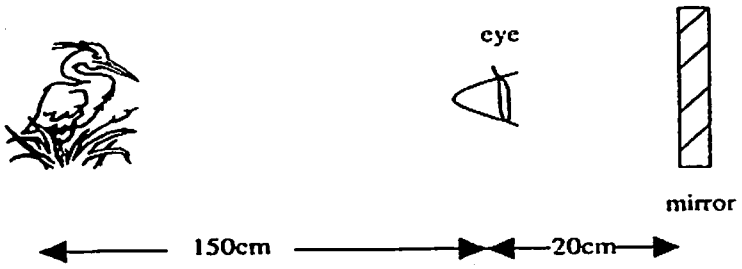


Which of the diagrams show the correct image of the paper clip as seen in the plane mirror?

A 
B 
C 
D 

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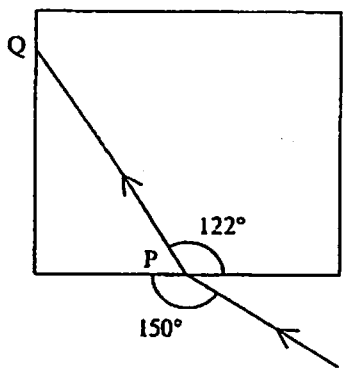
26. Julie is holding a plane mirror 20 cm in front of herself. She sees a bird that is 150 cm behind her.



What is the distance from her eyes to the image of the bird?

A 150 cm
B 170 cm
C 190 cm
D 340 cm

27. A ray of light passes from air into a rectangular glass block as shown in the diagram below.

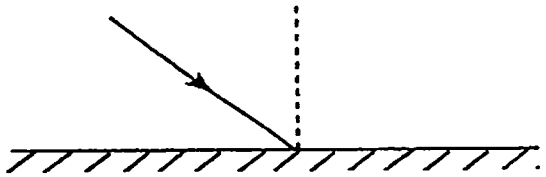


What is the angle of incidence and angle of refraction at point P?

	Angle of incidence	Angle of refraction
A	150°	122°
B	60°	32°
C	60°	58°
D	30°	58°

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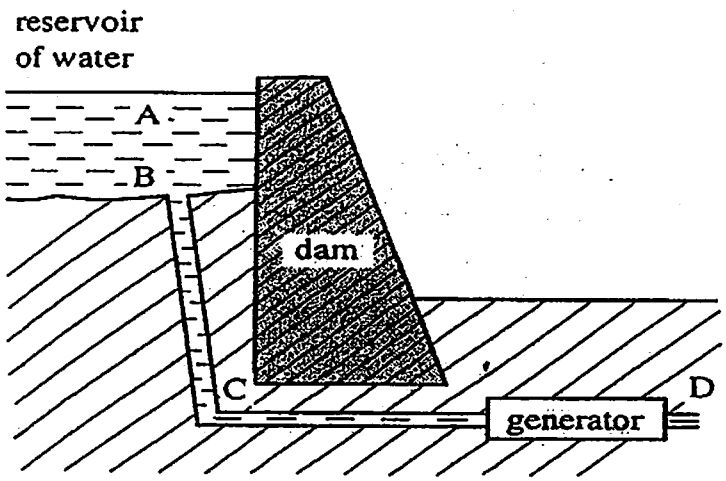
28. The diagram shows a ray of light striking a plane mirror.



What must the angle of incidence be if the total angle between the incident and reflected ray is 80° ?

A 40°
B 50°
C 80°
D 100°

29. The diagram shows part of a hydroelectric power station. At which point does water have the greatest gravitational potential energy?



30. Tim pushes a toy cart along a level road and lets it go. As the cart moves along the road, it starts slowing down. The biggest energy change is from.....

A chemical energy to thermal energy
B chemical energy to kinetic energy
C kinetic energy to thermal energy
D thermal energy to kinetic energy

End of Paper 1

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The Periodic Table of the Elements

Group I	Group II											Group III	Group IV	Group V	Group VI	Group VII	Group 0
							1 H hydrogen 1										4 He helium 2
7 Li lithium 3	9 Be beryllium 4											11 B boron 5	12 C carbon 6	14 N nitrogen 7	16 O oxygen 8	19 F fluorine 9	20 Ne neon 10
23 Na sodium 11	24 Mg magnesium 12											27 Al aluminium 13	28 Si silicon 14	31 P phosphorus 15	32 S sulfur 16	35.5 Cl chlorine 17	40 Ar argon 18
39 K potassium 19	40 Ca calcium 20	45 Sc scandium 21	48 Ti titanium 22	51 V vanadium 23	52 Cr chromium 24	55 Mn manganese 25	56 Fe iron 26	59 Co cobalt 27	59 Ni nickel 28	64 Cu copper 29	65 Zn zinc 30	70 Ga gallium 31	73 Ge germanium 32	75 As arsenic 33	79 Se selenium 34	80 Br bromine 35	84 Kr krypton 36
85 Rb rubidium 37	88 Sr strontium 38	89 Y yttrium 39	91 Zr zirconium 40	93 Nb niobium 41	96 Mo molybdenum 42	– Tc technetium 43	101 Ru ruthenium 44	103 Rh rhodium 45	106 Pd palladium 46	108 Ag silver 47	112 Cd cadmium 48	115 In indium 49	119 Sn tin 50	122 Sb antimony 51	128 Te tellurium 52	127 I iodine 53	131 Xe xenon 54
133 Cs caesium 55	137 Ba barium 56	139 La lanthanum 57 *	178 Hf hafnium 72	181 Ta tantalum 73	184 W tungsten 74	186 Re rhenium 75	190 Os osmium 76	192 Ir iridium 77	195 Pt platinum 78	197 Au gold 79	201 Hg mercury 80	204 Tl thallium 81	207 Pb lead 82	209 Bi bismuth 83	– Po polonium 84	– At astatine 85	– Rn radon 86
– Fr francium 87	– Ra radium 88	– Ac actinium 89 †															

*58-71 Lanthanoid series
†90-103 Actinoid series

140 Ce cerium 58	141 Pr praseodymium 59	144 Nd neodymium 60	– Pm promethium 61	150 Sm samarium 62	152 Eu europium 63	157 Gd gadolinium 64	159 Tb terbium 65	162 Dy dysprosium 66	165 Ho holmium 67	167 Er erbium 68	169 Tm thulium 69	173 Yb ytterbium 70	175 Lu lutetium 71
232 Th thorium 90	– Pa protactinium 91	238 U uranium 92	– Np neptunium 93	– Pu plutonium 94	– Am americium 95	– Cm curium 96	– Bk berkelium 97	– Cf californium 98	– Es einsteinium 99	– Fm fermium 100	– Md mendelevium 101	– No nobelium 102	– Lr lawrencium 103

Key: a X b — a = relative atomic mass; X = atomic symbol; b = proton (atomic) number

The volume of one mole of any gas is 24 dm^3 at room temperature and

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Name: ..... Reg. No. ..... Class: .....

St.Margaret's Secondary School

Mid-Year Examination 2012

Founded 1842

LOWER SECONDARY SCIENCE

Secondary Two Express
Paper 2 (70 marks)

9 May 2012
Duration: 2 Hours (For both Papers 1 and 2)
Total Marks: 100 (For both Papers 1 and 2)

Additional Materials: NIL

Instructions to candidates

1. Write your name, register number and class at the top of the cover page.
2. Paper 2 consists of Section A and Section B.
   Answer **all** questions in **Section A** in the spaces provided.
   Answer **any four** questions in **Section B** in the spaces provided.
3. Marks to each question or part of a question are indicated in brackets [ ] at the end of the questions.
4. Calculators are allowed. For quantitative answers, all essential working must be clearly shown and appropriate units indicated.
   Omission of working or incorrect use of units will result in the loss of marks
5. A copy of the Periodic Table has been printed on Page 14 of Paper 1.

Paper	Marks (Physics/ Chemistry)	Marks (Biology)
I (30 mks)		
2-A (30 mks)		
2-B (40 mks)		
Total (100 mks)		

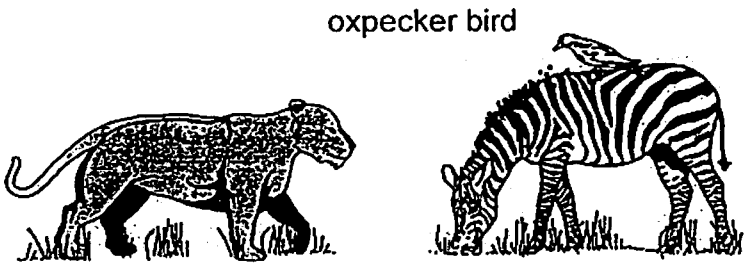
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Section A (30 marks)

Answer *all* questions in this section in the spaces provided.

1. In an African safari, lions prey on zebras and zebras feed on grass. The zebras are often infested with ticks, which suck the zebra's blood. Ticks are also a source of food for the oxpecker bird..



lion zebra

Using the information provided

a state the type of relationship between the

(i) lion and the zebra: .....

(ii) oxpecker and the zebra: .....

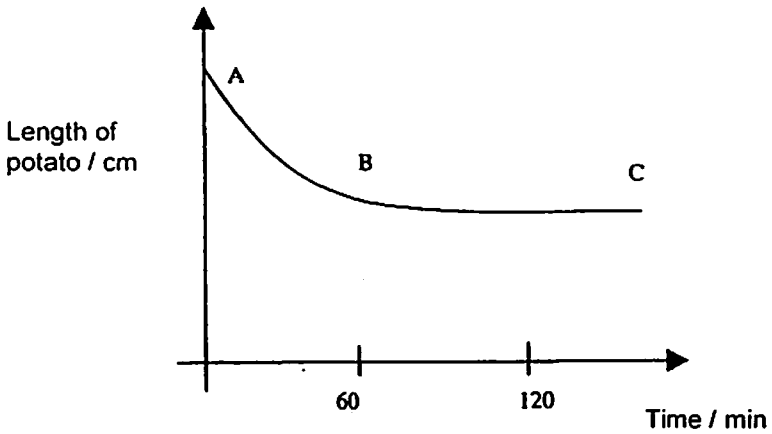
(iii) ticks and the zebra: ..... [3]

b draw a food web involving all the organisms mentioned [2]

c draw a pyramid of numbers showing four food links. [1]

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2. A thin strip was cut from a peeled raw potato and soaked in concentrated sucrose solution for 2 hours. The length of the potato strip was measured over a period of time. The graph below shows the result.



a Explain, in terms of potato cells, the shape of the graph from

(i) A to B:

.....

.....

.....

[2]

(ii) B to C:

.....

.....

.....

[2]

b Why should the potato skin be removed before carrying out the experiment?

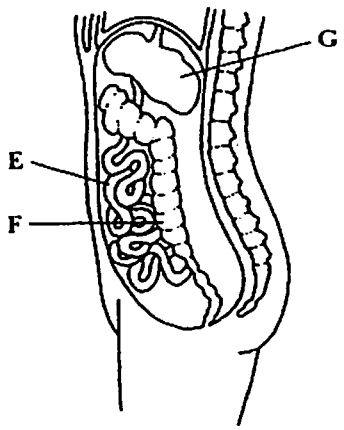
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[1]

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3. The figure shows the side view of the alimentary canal within a person's abdomen.



a Some people experience a burning sensation known as 'heartburn' after eating certain types of food. Heartburn is caused by excess acid.

(i) Which of the structures (E, F or G) in the human alimentary canal produces this acid? [½]

Structure: .....

(ii) Name the acid produced in this structure: ..... [½]

(iii) What is the role of this acid in chemical digestion?

.....

..... [1]

(iv) People who suffer from heartburn can relieve their pain by taking medicines known as antacids. Doctors usually recommend that patients chew the antacids before swallowing them. Suggest one reason why this is recommended.

.....

..... [1]

b In which structure of the alimentary canal (E, F or G) is digestion completed?

Structure: ..... [½]

c In the case of a person suffering from diarrhoea, which structure of the alimentary canal (E, F or G) is not functioning properly?

Structure: ..... [½]

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4. Study the table of melting points and boiling points of the substances shown below and answer the questions that follow:

Substances	Chlorine	Sulfur dioxide	Ammonia	Butane
Melting point /°C	-101	-73	-77	-135
Boiling poing /°C	-35	-10	-33	-0.5

a Which of these substances is a solid at -75°C?

..... [1]

b Above what temperature do only two of the substances exist as solid?

..... [1]

c What would you expect to happen if a beaker containing liquid butane was placed in a bigger beaker of melting ice?

.....

..... [1]

5. The table below shows some information about atoms X and Y.

a Complete the table by filling in the missing information.

Atoms	Ionic structure		
	Number of protons	Number of electrons	Symbol of ion
X	9	10	
Y		10	Y^{3+}

[2]

b State the Group and Period on the Periodic Table that atoms X and Y belong to.

.....

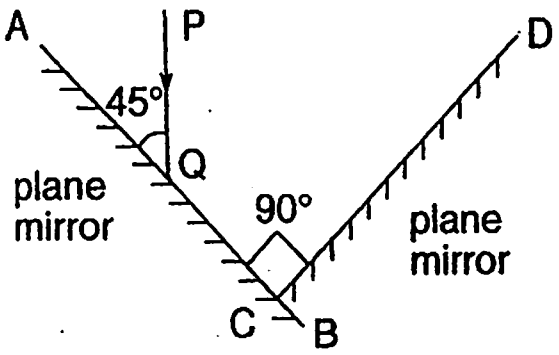
..... [2]

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c Aluminium chloride is a compound used in antiperspirants. If aluminium chloride is formed when aluminium and chlorine atoms combine in the ratio 1:3, write out the formula for aluminium chloride.

Formula for aluminium chloride: ..... [1]

6. Two plane mirrors AB and CD are placed at 90° to one another as shown in the diagram below.



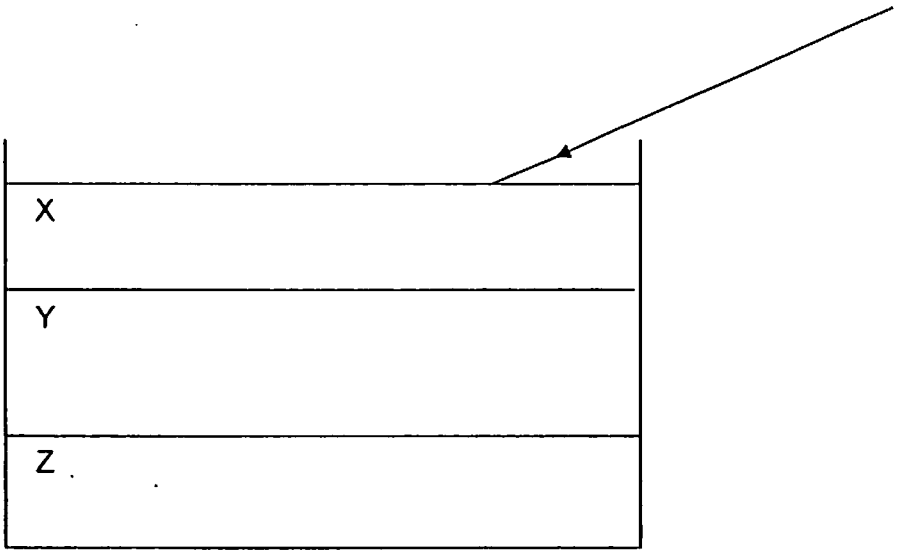
a Complete the diagram by showing the path of ray PQ after reflection at mirrors AB and CD. [1]

b What is the angle of reflection at mirror CD?

..... [1]

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7. The figure below shows a beaker containing three substances, X, Y and Z
A ray of light in air is incident on substance X.



The table below shows the densities of air, steel, oil and water.

	Air	Steel	Oil	Water
Density / kg/m^3	1.02	8 000	800	1 000

a Referring to the information provided in the table, what are substances X, Y and Z?

Substance	Name of substance
X	
Y	
Z	

[2]

b Complete the path of the light ray incident on X as it passes through the different substances until it emerges into the air again. [3]

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Section B (40 marks)

There are ***five*** questions in this Section.
You are to answer ***any four*** questions in the spaces provided.

8a. Explain why an image can be formed in a plane mirror but an image is not formed by light reflected from a piece of paper.

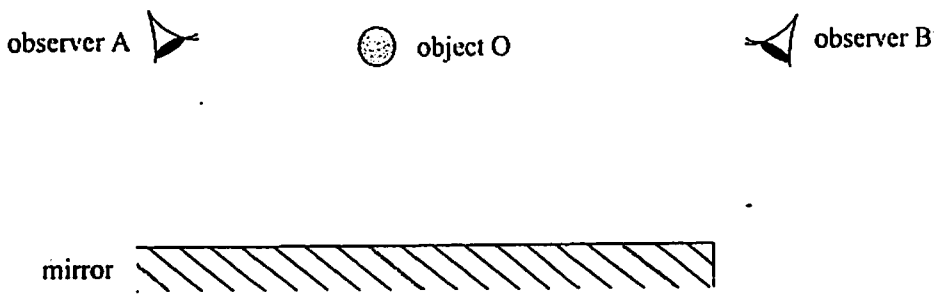
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.....

.....

..... [2]

b The diagram below shows an object at O placed in front of a plane mirror. Two observers A and B are positioned as shown.



(i) Mark on the diagram above, the position of the image of O and label it 'I'. [1]

(ii) Draw one light ray from the object, reflecting from the mirror into the eye of Observer A. Hence show how Observer A is able to see the image at 'I'. [2]

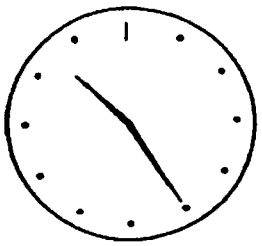
(iii) Show on the same diagram whether Observer B can see the image of the object. [3]
Can Observer B see the image of the object?

.....

.....

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c If the Object O is a wall clock, and its image as seen in a plane mirror shows the time in the figure below,



state the **actual time** shown by the wall clock if the observation is made during the day?

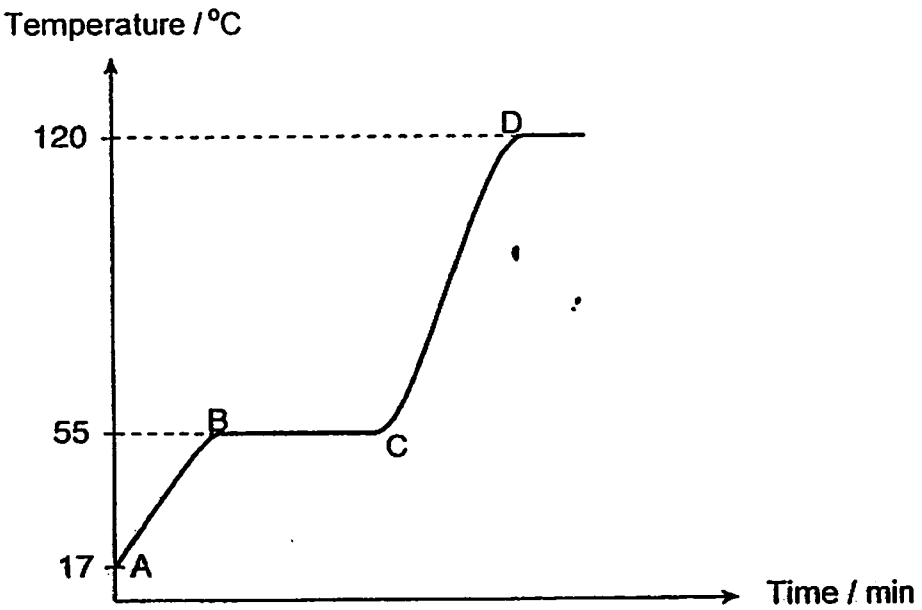
[1]

.....

d Which characteristic of images formed by a plane mirror is evident in (8c) ?

..... [1]

9. The graph below shows the temperature change during the heating of substance L, a solid.



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a Write down the state substance L is in at the following stages on the graph:

(i) AB:.....

(ii) BC:.....

(iii) CD:.....

(iv) Beyond D: ..... [2]

b What is the melting point and boiling point of substance L?

.....

..... [2]

c Describe how the behaviour of the particles in substance L will change in terms of their average kinetic energy, arrangement and forces of attraction if substance L is heated from C to D.

.....

.....

.....

.....

.....

..... [3]

d If substance L produces a scent while it is boiling, explain why the scent is stronger when one is nearer the boiling substance than when one is far away.

.....

.....

.....

.....

.....

..... [3]

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10a. The atoms of beryllium and magnesium are represented respectively by ... is $^{9}_{4}Be$ and $^{24}_{12}Mg$.

(i) Write down the electronic configuration of an atom of magnesium.

..... [1]

(ii) In which group of the Periodic Table is magnesium placed?

..... [1]

(iii) How do the electronic structures of beryllium and magnesium indicate th... and period in the Periodic Table?

.....

.....

.....

..... [2]

(iv) Draw the structure of the magnesium ion. [1]

b **Indicate whether each of the following statements is True (T) or False (F) ... the letters T or F. If the statement is False (F), re-write the statement, correcting ... part(s) that are incorrect in the space provided.**

(i)	In an atom, neutrons are negatively charged.	T
(ii)	Molecules are always made up of different atoms.	T
(iii)	Molecules of water expand when heated.	T
(iv)	An atom of iron (Fe) is bigger in size than an atom of sodium (Na)	T

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Corrected statements:

.....

.....

.....

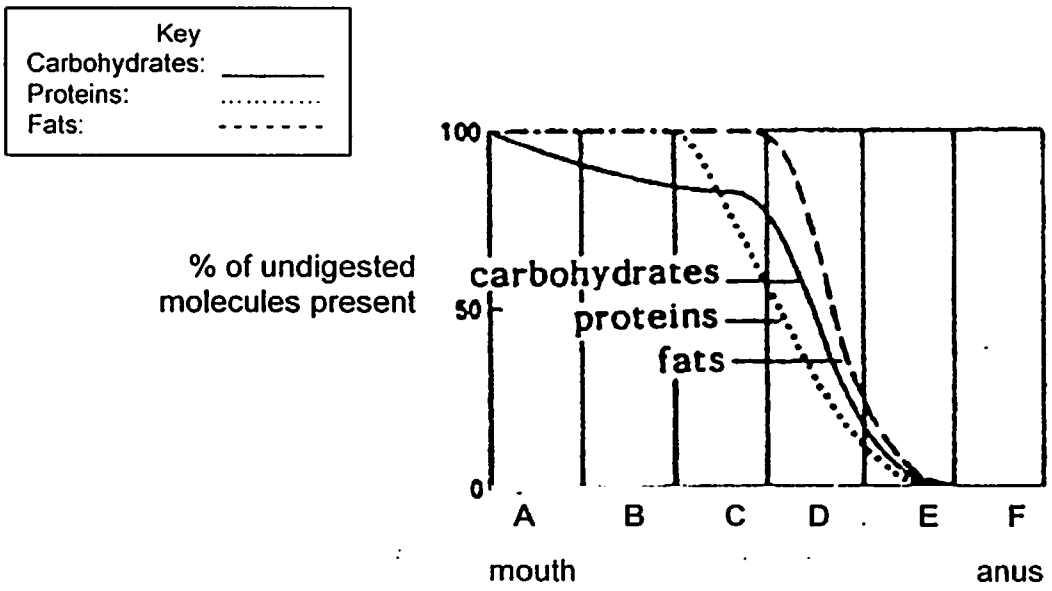
.....

.....

..... [3]

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11. The graph below shows the extent to which carbohydrates, proteins and fats are digested as food passes through the alimentary canal of man. The letters A to F represent successive parts of the alimentary canal. Use the graph to answer the questions below.



a Define the term 'digestion'.

.....

.....

..... [1]

b(i) Name two parts of the alimentary canal where physical digestion takes place.

.....

..... [1]

(ii) Explain how physical digestion in b(i) helps in chemical digestion.

.....

.....

.....

..... [2]

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(iii) Explain why the percentage of undigested protein molecules suddenly decreases in Region C.

.....

.....

.....

..... [2]

(iv) Name Region D.
Explain what happens to the carbohydrates, proteins and fats present in the food we eat when they are passing through Region D.

.....

.....

.....

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.....

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.....

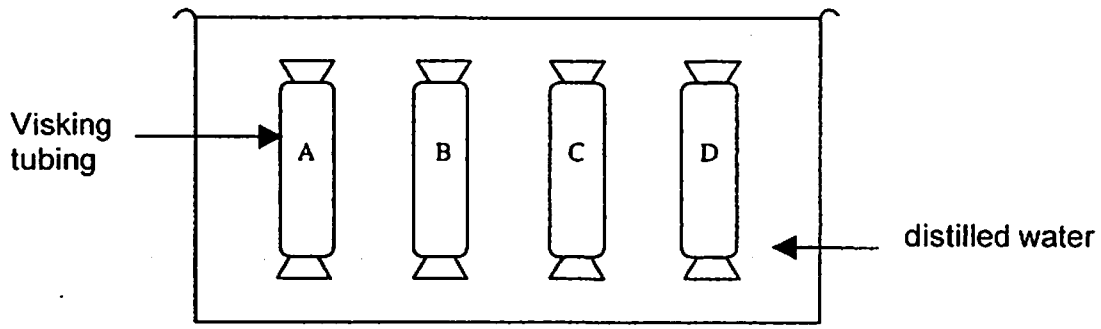
.....

.....

..... [4]

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12. The following experiment was set up to investigate osmosis.
Four equally-sized Visking tubings were filled with equal amounts of different liquids, A, B, C and D. The tubings were weighed first before being submerged into a beaker of distilled water for 1 hour. The tubings were then weighed again.



a The table below shows the masses of the Visking tubings before and after the experiment. Calculate the change in mass of each of the Visking tubings and record it in the table below.

Visking tubing with liquid	Mass of Visking tubing at the start /g	Mass of Visking tubing at the end /g	Change in mass of Visking tubing /g
A	20.0	21.2	
B	20.0	20.0	
C	20.0	24.9	
D	20.0	23.1	

[2]

b Using the information in (a), match the Visking tubings A,B, C or D with the contents given in the table below.

Visking tubing contents at the start of the experiment	Visking tubing
Distilled water	
5% sucrose solution	
25% sucrose solution	
60% sucrose solution	

[2]

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c Explain how you arrived at your answers for the Visking tubing containing

(i) distilled water

.....

.....

.....

.....

.....

..... [2]

(ii) 60% sucrose solution

.....

.....

.....

.....

.....

..... [2]

d Which apparatus used in the experiment represents the cell membrane? Give a reason for your answer.

.....

..... [1]

e Explain why plants die if too much fertilizer is added to the soil.

.....

..... [1]

End of Paper 2

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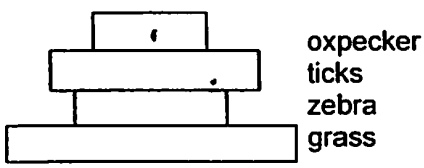
Paper I (30 marks)

1 mark for each correct answer.

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

Paper 2

Section A (30 marks)

Qn	Answers	Mks	Remarks
1a(i)	Predator-prey	1	No mks for wrong spelling
(ii)	Mutualism	1	
(iii)	Parasitism	1	
1b	Grass → zebra → ticks → oxpecker ↓ lion	2	1 mk for each correctly drawn food chain
1c	Pyramid of numbers  oxpecker ticks zebra grass	1	½ mk for correct shape ½ mk for correct order of organisms
2a (i)	From A to B, there is a decrease in the length of the potato strip. There is a higher water potential in the cells of the potato compared to the surrounding sucrose solution.(1) Therefore water (molecules) moved out of the potato cells by osmosis (1) causing a decrease in length of the potato strip.	2	Must show comparison of water potential in the cell and outside the cell Must mention direction of movement of water (molecules)

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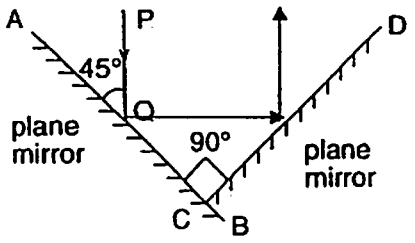
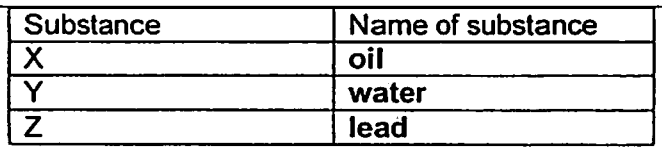
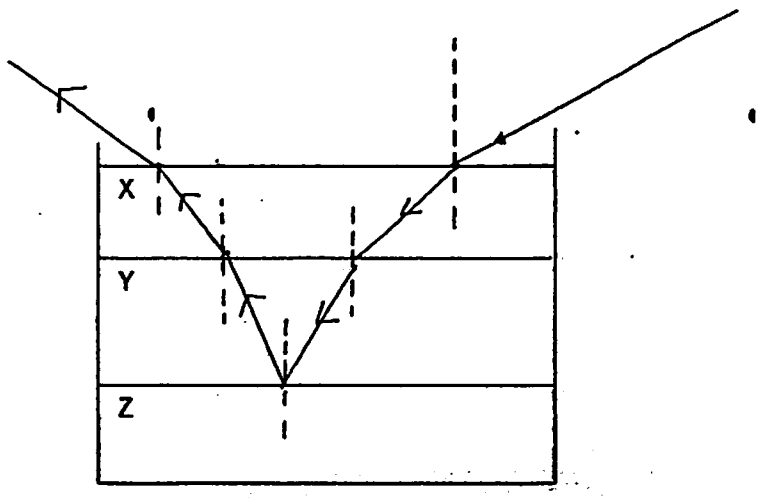
<table>
<tr><td></td><td></td><td></td><td>by osmosis</td></tr>
<tr><td>2a
(ii)</td><td>At BC, the length of the potato strip remained the same. The water potential in the cell and the sucrose solution has become equal. (1) There is no net movement of water (molecules) (1),causing the length of potato strip to remain unchanged.</td><td>2</td><td></td></tr>
<tr><td>2b</td><td>The potato skin is a non-permeable to water (1/2) and will prevent osmosis (1/2) from taking place.</td><td>1</td><td></td></tr>
<tr><td></td><td></td><td></td><td></td></tr>
<tr><td>3a
(i)</td><td>Structure: G</td><td>½</td><td></td></tr>
<tr><td>(ii)</td><td>Hydrochloric acid</td><td>½</td><td>No mks for wrong spelling</td></tr>
<tr><td>(iii)</td><td>It provides an acidic medium for protease to work.</td><td>1</td><td></td></tr>
<tr><td>(iv)</td><td>Chewing the antacid will increase the surface area of the antacid (1/2), which will help to speed up the neutralization of the excess acid(1/2) in the stomach.</td><td>1</td><td></td></tr>
<tr><td>3b</td><td>Structure: E</td><td>½</td><td></td></tr>
<tr><td>3c</td><td>Structure: F</td><td>½</td><td></td></tr>
<tr><td></td><td></td><td></td><td></td></tr>
<tr><td>4a</td><td>Sulfur dioxide</td><td>1</td><td></td></tr>
<tr><td>4b</td><td>Above -101°C</td><td>1</td><td>No unit for temp
-minus ½</td></tr>
<tr><td>4c</td><td>The butane will boil off.</td><td>1</td><td></td></tr>
<tr><td></td><td></td><td></td><td></td></tr>
<tr><td>5a</td><td>
<table>
<tr><td>Atoms</td><td colspan="3">Ionic structure</td></tr>
<tr><td></td><td>No. of protons</td><td>No. of electrons</td><td>Charge</td></tr>
<tr><td>X</td><td>9</td><td>10</td><td>X^-</td></tr>
<tr><td>Y</td><td>13</td><td>10</td><td>Y^{3+}</td></tr>
</table>
</td><td>1

1</td><td></td></tr>
<tr><td>5b</td><td>Atom X belongs to Group VII and Period 2.

Atom Y belongs to Group III and Period 3</td><td>1

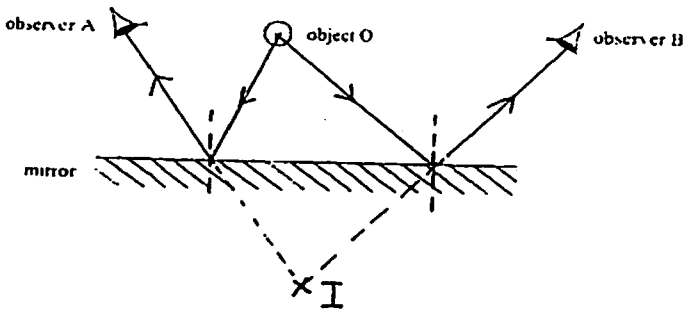
1</td><td>Do not accept Group 7, Period II
Do not accept Group 3, Period III</td></tr>
</table>

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5c	Formula for aluminium chloride: $AlCl_3$	1	
6 (a)		½ ½	Correctly shows reflection at AB Correctly shows reflection at CD No directional arrows on rays : minus ½ No normal: minus ½
(b)	Angle of reflection at CD: **45°**	1	
7a		1½	(½ mk for each correct answer)
7b		[3]	Shows ray bending towards normal at XY boundary (½) and YZ boundary(½) Shows ray reflected at Z & angle i = angle r (½) Shows ray bending away fr normal at ZY boundary (½) YX boundary (½) and boundary between X and air (½) No normal and No direction arrows on rays minus 1 for whole qn

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Section B (40 marks)

8a	Light striking a **plane mirror** results in **regular reflection** which enables an **image to be formed**. However, a **piece of paper** is not as smooth as it appears. When light strikes a piece of paper, it results in **irregular reflection**. Therefore no **image** is formed.	1 1	
8b (i) & (ii)		1 1 1	Correctly shows position of image (I) Correctly shows light ray from imag to eye of observer A (reflected ray) and object to mirror (incident ray)
8b(iii)	From the diagram, Observer B can see the image of the Object O	2 1	Correctly shows light ray from image to eye of observer B (reflected ray) and object to mirror (incident ray)
8c	The actual time is **1.35 pm**	1	
8d	The image is **laterally inverted.**	1	
9a (i)	AB: **solid**	½	
(ii)	BC: **solid and liquid**	½	
(iii)	CD: **liquid**	½	
(iv)	Beyond D: **gas**	½	
9b	Melting point: **55°C** Boiling point: **120°C**	1 1	
9c	As substance L is heated from C to D, the particles in L will gain energy and move faster. Their **average kinetic energy will increase.(1) The forces of attraction between the particles will weaken (1) and their arrangement will gradually change from one that is orderly to one that is less orderly.(1)**	3	

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9d	When substance L is boiling, the particles are moving very rapidly. Many of the particles gain enough energy to overcome the attractive forces (1/2) between them and escape into the surrounding air (1/2) where they are able to move freely and randomly. The high concentration of the particles around the boiling substance (1) makes the scent stronger. As the particles diffuse (1/2) into the surrounding air, their concentration decreases.(1/2) Therefore, the scent will not be as strong to one who is far away.	3	
10a(i)	Electronic configuration of magnesium: 2,8,2	1	
(ii)	Group II	1	
(iii)	Magnesium has the electronic configuration of 2,8,2. Beryllium has the electronic configuration 2,2. (1/2) Both beryllium and magnesium have two electrons in their outermost shell and are therefore placed in Group II. (1/2) Magnesium has 3 electron shells and is placed in Period 3 (1/2) while beryllium has 2 electron shells is therefore placed in Period 2 (1/2)	2	
10a (iv)		1	Shows correct no of electrons (1/2) Shows correct no of electron shells with correct charge written outside bracket [ ]
10b(i)	In an atom, neutrons are negatively charged: F	½	
(ii)	Molecules are always made up of different atoms: F	½	
(iii)	Molecules of water expand when heated: F	½	
(iv)	An atom of iron (Fe) is bigger than an atom of sodium (Na) : T	½	

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	Corrected statements:		
	(i): In an atom, **neutrons have no charge.**	1	
	(ii):Molecules may be made up of the **same atoms or different atoms.**	1	
	(iii): Molecules of water **do not expand** when heated. It is the **spaces between the molecules that increase** when water is heated.	1	
11a	Digestion is the **breaking down of large and complex food molecules** into **smaller, simpler molecules.**	1	
11b(i)	Physical digestion takes place in the **mouth, stomach or small intestine.**	1	Accept any 2 (1/2 mk each) A: mouth C: stomach D: small intestine
11b(ii)	In the **mouth,** the **teeth grind and the food into smaller pieces** which **increases the surface area for salivary amylase to act.** This **speeds up digestion of starch.** In the **stomach,** the food **is** churned and **broken up into smaller pieces** which **increases the surface area** for **proteases to act. This speeds up digestion of proteins.** **In the small intestine, bile emulsifies fats, breaking up fats into smaller oil droplets. This increases the surface area for lipase** to act and **speeds up digestion of fats.**	1 1 1	Explains how mechanical digestion in the **two** parts mentioned in b(i) help in chemical digestion. **(Max: 2 mks)**
11b(iii)	Region C is the **stomach.**(1) The glands in the stomach **produce protease** (1/2), an enzyme which **digests proteins** (1/2).	2	
11b(iv)	Region D is the **small intestine.** The small intestine consists of enzymes such as pancreatic amylase, maltase, proteases and lipase. Carbohydrates, such as **starch,** will be digested by **pancreatic amylase** to form **maltose.**(1/2) The **maltose** will then be digested by **maltase** to form **glucose.**(1/2) **Proteins will be digested by proteases** (1/2) to form **amino acids.**(1/2) **Fats will be digested by lipase** (1/2) to form **fatty acids and glycerol.**(1/2)	1 1 1 1	

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12a	A: +1.2 B: 0.0 C: +4.9 D: +3.1	2	½ mk for each correct answer No '+' : minus 1 for whole question.
12b	Distilled water: B 5% sucrose solution: A 25% sucrose solution: D 60% sucrose solution: C	2	½ mk for each correct answer
12c	Visking tubing B did not show any increase in mass, (1/2) which shows there was no net movement of water molecules.(1/2) Therefore, the contents in Visking tubing B and the surrounding liquid have equal water potential.(1/2) This means that Visking tubing B contains distilled water.(1/2) Visking tubing C showed the greatest increase in mass.(1/2) This shows that the number of water molecules entering the Visking tubing was the greatest (1/2) among the four. Therefore the difference in water potential between C and the surrounding liquid must be the greatest.(1/2) This shows that Visking tubing C has the lowest water potential, which is 60% sucrose solution.(1/2)	2 2	
12d	The Visking tubing. The Visking tubing is partially permeable, and so is the cell membrane.	½ ½	
12e	Adding too much fertilizer to the soil will lower the water potential around the root hairs (1/2) of the plant. This will cause water to leave the cells of the root hairs by osmosis (1/2) and cause the plant to be dehydrated and eventually die.	1	

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The Periodic Table of the Elements

Group I	Group II											Group III	Group IV	Group V	Group VI	Group VII	Group 0
							1 H hydrogen 1										4 He helium 2
7 Li lithium 3	9 Be beryllium 4											11 B boron 5	12 C carbon 6	14 N nitrogen 7	16 O oxygen 8	19 F fluorine 9	20 Ne neon 10
23 Na sodium 11	24 Mg magnesium 12											27 Al aluminium 13	28 Si silicon 14	31 P phosphorus 15	32 S sulfur 16	35.5 Cl chlorine 17	40 Ar argon 18
39 K potassium 19	40 Ca calcium 20	45 Sc scandium 21	48 Ti titanium 22	51 V vanadium 23	52 Cr chromium 24	55 Mn manganese 25	56 Fe iron 26	59 Co cobalt 27	59 Ni nickel 28	64 Cu copper 29	65 Zn zinc 30	70 Ga gallium 31	73 Ge germanium 32	75 As arsenic 33	79 Se selenium 34	80 Br bromine 35	84 Kr krypton 36
85 Rb rubidium 37	88 Sr strontium 38	89 Y yttrium 39	91 Zr zirconium 40	93 Nb niobium 41	96 Mo molybdenum 42	– Tc technetium 43	101 Ru ruthenium 44	103 Rh rhodium 45	106 Pd palladium 46	108 Ag silver 47	112 Cd cadmium 48	115 In indium 49	119 Sn tin 50	122 Sb antimony 51	128 Te tellurium 52	127 I iodine 53	131 Xe xenon 54
133 Cs caesium 55	137 Ba barium 56	139 La lanthanum 57 *	178 Hf hafnium 72	181 Ta tantalum 73	184 W tungsten 74	186 Re rhenium 75	190 Os osmium 76	192 Ir iridium 77	195 Pt platinum 78	197 Au gold 79	201 Hg mercury 80	204 Tl thallium 81	207 Pb lead 82	209 Bi bismuth 83	– Po polonium 84	– At astatine 85	– Rn radon 86
– Fr francium 87	– Ra radium 88	– Ac actinium 89 †															

*58-71 Lanthanoid series
†90-103 Actinoid series

140 Ce cerium 58	141 Pr praseodymium 59	144 Nd neodymium 60	– Pm promethium 61	150 Sm samarium 62	152 Eu europium 63	157 Gd gadolinium 64	159 Tb terbium 65	162 Dy dysprosium 66	165 Ho holmium 67	167 Er erbium 68	169 Tm thulium 69	173 Yb ytterbium 70	175 Lu lutetium 71
232 Th thorium 90	– Pa protactinium 91	238 U uranium 92	– Np neptunium 93	– Pu plutonium 94	– Am americium 95	– Cm curium 96	– Bk berkelium 97	– Cf californium 98	– Es einsteinium 99	– Fm fermium 100	– Md mendelevium 101	– No nobelium 102	– Lr lawrencium 103

Key: a = relative atomic mass; X = atomic symbol; b = proton (atomic) number

. olume of one mole of any gas is 24 dm^3 at room temperature and

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