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Class	Index Number	Name

HENDERSON SECONDARY SCHOOL

END-OF-YEAR EXAMINATION 2014
SECONDARY 2 EXPRESS

Lower Secondary Science

Wednesday 1st October 2014
Booklets A and B : 2 hours

Additional materials :
Multiple Choice Answer Sheet

READ THESE INSTRUCTIONS FIRST

Write your Name, Index number and Class on all the work you hand in.
Do not use staples, paper clips, highlighters, glue or correction fluid.

For Section A, shade your answers in soft pencil on the OTAS form.

There are **thirty** questions in this section. Answer **all** questions. For each question there are four possible answers **A**, **B**, **C** and **D**. Choose the **one** you consider correct and record your choice in **soft pencil** on the separate Answer Sheet.

Read the instructions on the Answer Sheet very carefully.
Each correct answer will score one mark. A mark will be deducted for a wrong answer.
Any rough working should be done in this booklet.

A copy of the Periodic Table is printed on page 11.

BOOKLET A

Hand in OTAS separately from the booklet A.

This document consists of **11** printed pages.

Setter: Ms Evelyn Wu

[Turn over

Section A [30 marks]

1 Which of the following contains **only** elements?

A bronze, gold, iron

B chlorine, carbon dioxide, lead

C salt, sugar, water

D silicon, sulfur, zinc

2 The table shows information related to three different substances, P, Q and R. Substances Q and R have more than two components.

substance	information
P	made up of one type of atom
Q	components that make up the substance exist in a fixed ratio
R	components that make up the substance can still be seen

Based on the table, which of the following statements is **true**?

A A chemical reaction is involved to produce substance Q but not substance R.

B If substance R is mixed with substance P by physical means, the properties of the substances will change.

C Substance P and Q cannot be separated into simpler substances.

D Substance P must be a metal.

3 A substance has high boiling point and it is a good conductor of heat.
This substance is **most likely** to be

A chlorine. **B** copper. **C** nitrogen. **D** oxygen.

4 Which of the following is a property of metals?

A brittle

B dull

C malleable

D non-sonorous

5 Which of the following is a liquid at room temperature?

A carbon

B magnesium

C mercury

D zinc

6 Nadia is stung by a bee. Her mother rubs dilute acid on her wound to relieve the pain. What can you infer from this observation?

A The bee sting contains an element which reacts with the acid.

B The bee sting is acidic.

C The bee sting is alkaline.

D The bee sting is neutral.

7 A student tested solutions X, Y and Z with universal indicator and recorded the following results.

solution	colour
X	green
Y	yellow
Z	purple

Which of the following shows the correct properties of the three solutions?

	X	Y	Z
A	acidic	alkaline	neutral
B	alkaline	acidic	neutral
C	alkaline	neutral	acidic
D	neutral	acidic	alkaline

8 Which of the following pairs when mixed will form a solution of pH 9?

A ammonia solution and water

B equal volumes of hydrochloric acid and potassium hydroxide

C magnesium and excess nitric acid

D sodium hydroxide and water

9 Both solutions Q and R are of the same volume and consist of the same type of solute and solvent. Solution Q contains the maximum amount of solute. Solution R contains a small amount of solute.

Which of the following statements about the solutions Q and R is **false**?

A Solution Q has more solute than solution R.

B Solution Q is more dilute than solution R.

C Solution R can dissolve more solute.

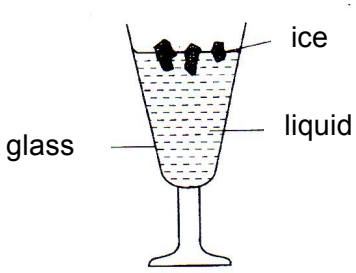
D Solution R is more dilute than solution Q.

10 Which of the following changes are caused by exposure to light?

I burning of charcoal
II decomposition of silver bromide on film
III manufacturing food by green plants
IV production of vitamin D in skin

A I and II **B** I and III **C** II and III **D** II, III and IV

11 The diagram shows some pieces of ice being used to cool the glass of orange juice. What is the **main** process by which the orange juice at the bottom of the glass becomes cooled?



A condensation

B conduction

C convection

D radiation

12 The Siberian Husky is a breed of working dog that originated from eastern Siberia, where average temperatures are below 0ºC .

In Singapore, people who keep the Siberian Husky as pets have to keep them in air conditioned rooms. Why is this so?

A Their owners want them to be as comfortable as possible.

B Their thick fur can keep them warm in the cold air conditioned room.

C Their thick fur makes them feel cold.

D They are more used to the humidity in air conditioned rooms.

13 Where would you store fried rice to keep it as hot as possible?

A metal box

B metal plate

C plastic box

D porcelain plate

14 Which of the following household appliances needs the help of convection currents to work?

A air-conditioner

B electric blender

C electric fan

D microwave oven

15 When a piece of metal is heated, which of the following physical quantity(s) will change?

I density
II mass
III volume
IV weight

A I only

B I and III only

C II and III only

D III and IV only

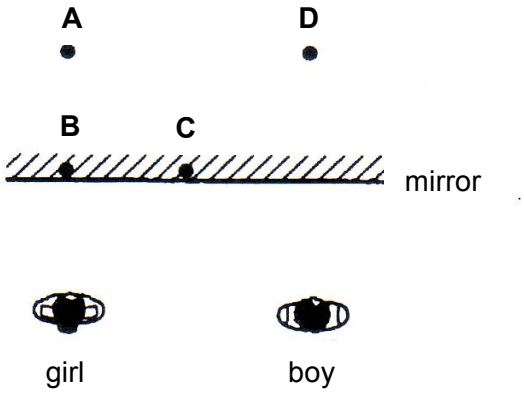
16 A fish in a pond appears to be 1.6 m from the surface of a pond. Given that the refractive index of water is 1.33, what is the real depth of the fish?

A 0.84 m **B** 1.20 m **C** 2.13 m **D** 2.93 m

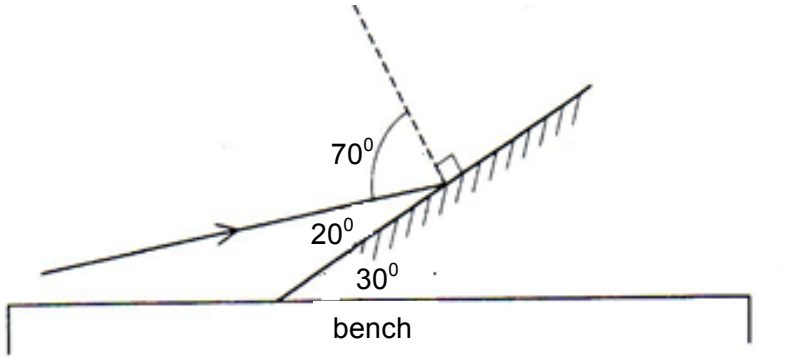
17 What type of mirror is used in a dental instrument?

A concave mirror **B** convex mirror **C** plane mirror **D** shiny mirror

18 A boy stands beside a girl in front of a large plane mirror. They are both of the same distance from the mirror. Where does the boy see the girl's image?



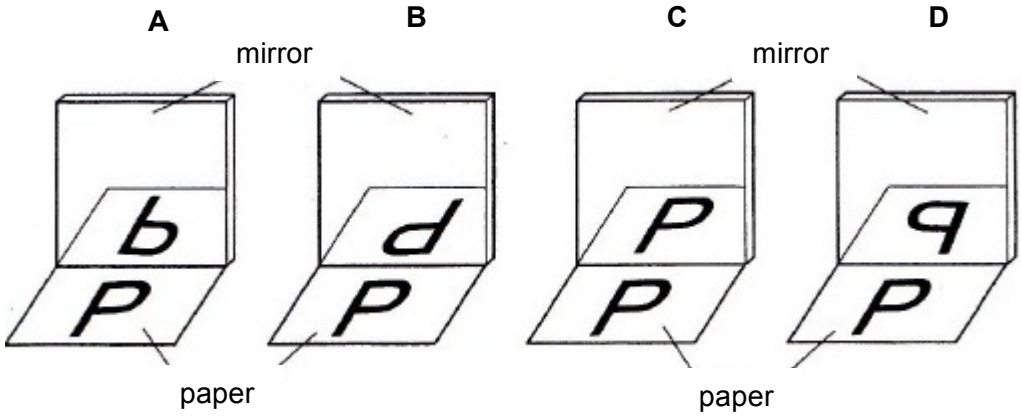
19 A mirror is placed tilted at an angle of 30^0 to the bench. A ray of light is directed so that it hits the mirror at an angle of 20^0 to the surface of the mirror.



What is the angle of reflection of the ray?

A 20^0 **B** 30^0 **C** 50^0 **D** 70^0

20 A student looks at the letter P on a piece of paper, and its reflection in a mirror. What does he see?



21 Edmund and Eugene run up Bukit Timah hill at the same time. Edmund weighs more than Eugene.

Which statement is **true** about the power produced?

A Edmund produces more power.

B Eugene produces more power.

C It is impossible to tell who produces more power.

D They both produce the same power.

22 Four electric heating elements convert electrical energy into heat energy.
Which heating element has the **lowest** power rating?

	energy converted
A	100 J in 5 s
B	200 J in 5 s
C	500 J in 20 s
D	600 J in 20 s

23 Which process best describes how electricity is produced in a power station?

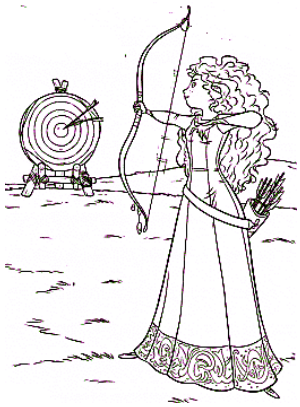
A steam → boils water → water turns turbine → generator produces electricity

B steam → condenses to water → water turns generator → turbines produce electricity

C steam → turns generator → turbine produces electricity

D steam → turns turbines → generator produces electricity

24 Merida released an arrow towards the target.



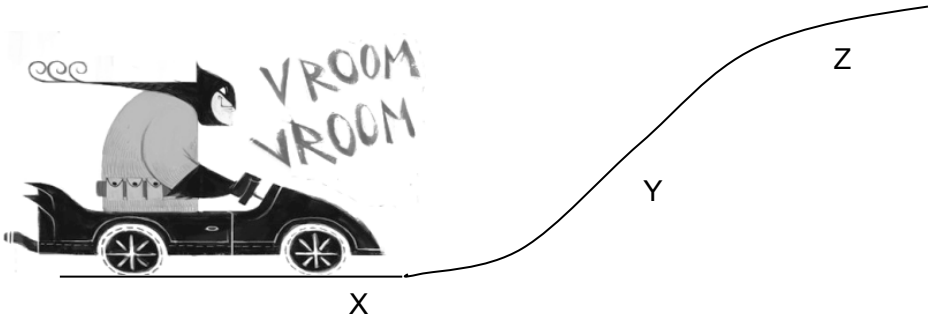
Some information about the energy involved is given below.

Elastic potential energy before arrow is released = 375 J
Kinetic energy of the arrow when it is released = 350 J

What is the amount of energy lost when the arrow is released?

A 0 J **B** 25 J **C** 375 J **D** 725 J

25 Batman drives his Batmobile up a slope at constant speed 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 potential energy at X is the greatest.

C The potential energy is always greater than the kinetic energy.

D The total energy at Z is equal to the total energy at X.

26 Greg is working on a research report on renewable energy sources for a school project. Some information which he found is given below.

I A renewable energy source is one which will be used up one day.
II Some examples of renewable energy source are the sun, the wind and the sea.
III Fossil fuel is the most commonly used renewable energy source used today.

Which information is/are **correct** ?

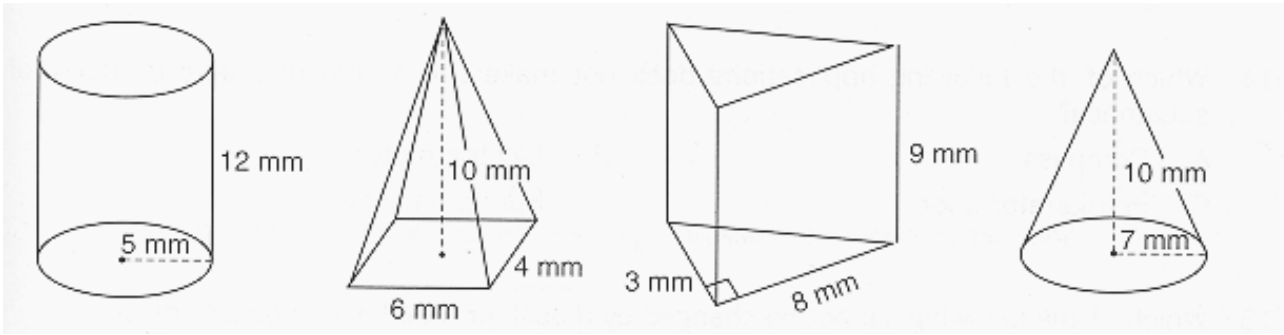
A I only

B II only

C I and III

D I, II and III

27 Four objects A, B, C and D of different shapes are resting on a horizontal surface. All the four objects, which are not drawn to scale, have the same weight. Which object would exert the greatest pressure on the surface?



A **B** **C** **D**

28 Which of the following objects works using magnetic force?

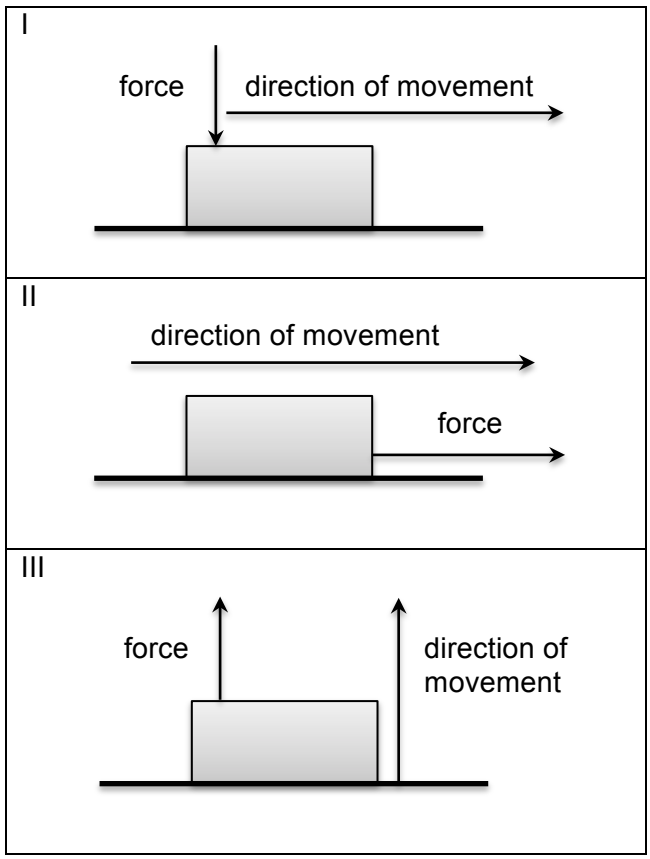
A compass

B electric iron

C microwave oven

D spring balance

29 Which of the following show(s) **no** work done on the box?



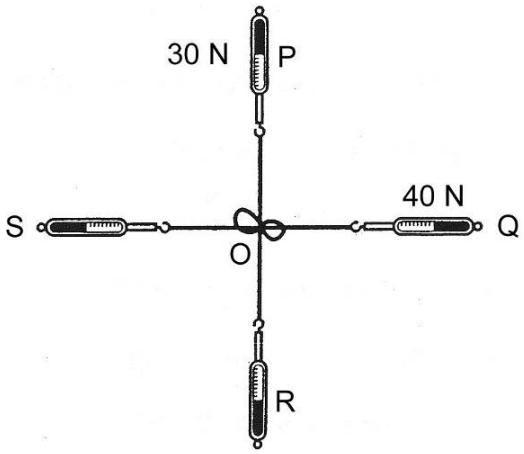
A I only

B II only

C I and III

D II and III

30 The diagram shows four forcemeters (spring balances) joined together by pieces of string with a knot at O. The strings are at 90° to each other.



The knot at O does not move when the readings on P and Q are as shown.
What are the readings on R and S?

	R	S
A	0 N	70 N
B	30 N	40 N
C	40 N	30 N
D	70 N	0 N

--- End of Booklet A ---

DATA SHEET
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 Sulphur 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	226 Ra Radium 88	227 Ac Actinium 89 †															

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

Lanthanoid 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
Actinoid series													
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 pressure (r.t.p.).

Class	Index Number	Name

HENDERSON SECONDARY SCHOOL

END OF THE YEAR EXAMINATION 2014
SECONDARY 2 EXPRESS

Lower Secondary Science

Wednesday 1st October 2014

Additional materials :
Writing paper (upon request only)

Booklets A and B : 2 hours

READ THESE INSTRUCTIONS FIRST

Write your Name, Index number and Class.
Do not use staples, paper clips, highlighters, glue or correction fluid.
For Sections B and C, write in dark blue or black pen.
You may use a soft pencil for any diagrams or graphs.

Section B (40 marks)
Answer **all** questions in Section B.
Write your answers in the spaces provided on the question paper.

Section C (30 marks)
Answer **all** questions in Section C.
Write your answers in the spaces provided on the question paper.

In calculations, you should show all the steps in your working, giving your answer at each stage.

The number of marks is given in brackets [ ] at the end of each question or part question.

Take the value of the gravitational field strength (*g*) on Earth to be 10 N/kg.

BOOKLET B

Hand in Booklet A separately from Booklet B.

This document consists of **12** printed pages

Setter: Ms Evelyn Wu

[Turn over

Section B (40 marks)

For Examiner's Use

1 **(a)** "The solubility of baking soda is 9.5 g/100 cm^3 water at room temperature." Explain what this statement means.

.....

.....[1]

(b) **(i)** In an experiment, Natasha stirred 6 g of baking soda in 50 cm^3 of water. What would she observe? Explain your answer with reference to the information given in **1(a)**.

observation

.....

.....

explanation

.....

.....[2]

(ii) Natasha repeated the experiment under the same conditions but this time she stirred the mixture *very* v*igorously.*

How does this action affect the result of this experiment?

.....

.....[1]

(iii) List two other variables that can increase the rate of dissolving baking soda in water.

.....

.....[2]

For Examiner's Use

2 **(a)** A student heated some substances in air and tabulated the results in the table given below.

substance	observations		
	before heating	during heating	after heating
magnesium ribbon	silvery grey solid	bright glow was given off	white solid
copper wire	reddish brown solid	black solid	black solid
lead foil	silvery grey solid	molten silvery grey droplets	silvery grey solid

(i) Which substance undergoes a physical change?
Give a reason, supporting your answer with an evidence from the experiment.

.....

.....

.....

.....[2]

(ii) Write a word equation to represent the combustion of any **one** of the substances in the table above.

.....[1]

(b) For each of the situation below, write the name of the reaction and a word equation for the reaction taking place.

(i) Pauline was trying to melt some sugar in a pot. However, she left the pot on the stove for too long and the sugar turned into a black solid. She noticed steam being produced.

Name of reaction: .....[1]

Word equation: .....[1]

(ii) Wilson passed electricity through green copper chloride solution.
A reddish brown solid appears and chlorine gas is produced.

Name of reaction: .....[1]

Word equation: .....[1]

For Examiner's Use

3 **(a)** Complete the following word equations: [4]

(i) calcium + …….....

→ calcium sulfate + ...gas

(ii) hydrochloric acid + …… ……

→ calcium chloride + carbon dioxide gas + water

(iii) nitric acid + iron hydroxide → …….....…… + water

(b) Describe a test for the presence of hydrogen? List the positive result in your answer.

.....

.....

.....

.....[2]

(c) Ah Mei inserted an egg into a bottle of vinegar. She left the bottle of vinegar with the egg on the table. After a week, she was shocked to observe that the egg had no shell. Explain what has happened?

.....

.....

.....

.....[2]

For Examiner's Use

4 A boat is between two cliffs. Cliff A is nearer to the boat than cliff B.
The boat sounded its horn once. Two clear echoes are heard by a person on the boat.
An echo is made when sound is reflected back or bounced back from a surface.

The first echo is heard 2.5 s after the horn sounds.
The second echo is heard 4.0 s after the horn sounds.

(a) Which cliff (A or B) caused the first echo ? .....[1]

(b) Sound travels at 330 m/s in the air.
Calculate the distance between the boat and cliff A.

distance between the boat and cliff A = ……..……m [2]

(c) Calculate the distance between the boat and cliff B.

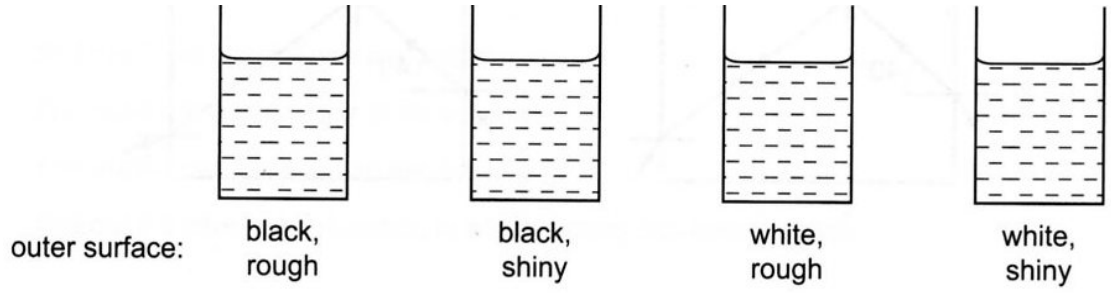
distance between the boat and cliff B = ……..……m [2]

(d) Calculate the total distance between cliffs A and B.

total distance between cliffs A and B = ……..……m [2]

For Examiner's Use

5 Four metal mugs are identical except for the colour and texture of their outer surfaces.



100 cm^3 of water at 80^0C is poured into each mug and the mugs are then left undisturbed for 20 minutes.

(a) Arrange the mugs according to the rate at which they lose heat, starting with the one that loses heat most rapidly. [2]

1st : ……..

2nd : ……..

3rd : ……..

4th : ……..

(b) In the above experiment, name the process by which heat is lost to the surroundings.

.....[1]

(c) Slow cooling is preferred when we want to keep things hot for a long time. Suggest and explain two ways how heat loss can be reduced in the storage of hot food.

.....

.....

.....

.....[2]

(d) Where should an air-conditioner be placed in a room so that the room gets cold within the shortest period of time? Explain your answer.

.....

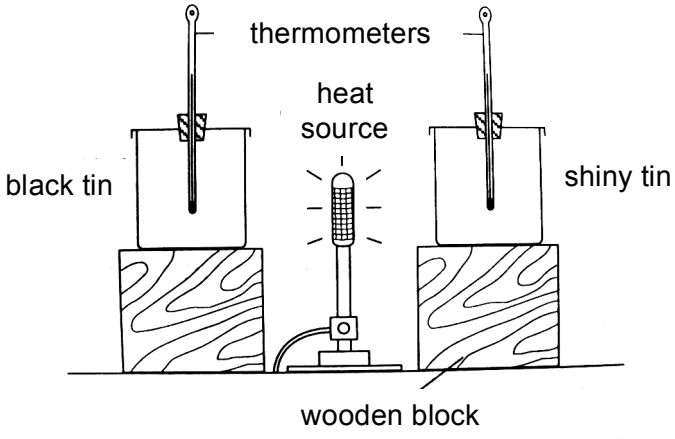
.....

.....

.....[2]

For Examiner's Use

6 A set-up of two tins is shown below.



(a) Describe and explain what happens if the heat source is switched on for 20 minutes.

.....

.....

.....

.....[2]

(b) After some time, the heat source is switched off when both thermometers register the same temperature.

Describe what will be observed to the temperatures measured by the thermometers in the next 20 minutes. Explain your answer.

observation:

.....

.....

explanation:

.....

.....[2]

(c) Explain why convection currents **cannot** take place in solids.

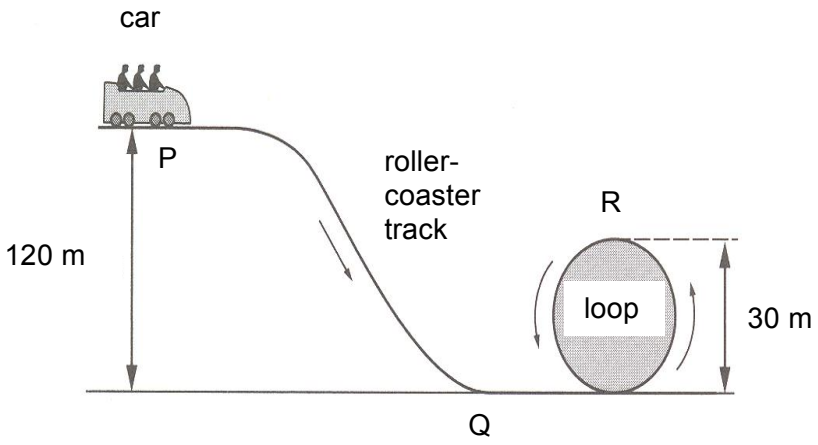
.....

.....[1]

Section C (30 marks)

For Examiner's Use

7



The diagram shows a 150 kg car on the roller-coaster track being released from rest at a height of 120 m.

(a) (i) What is the gravitational potential energy of the car before being released from rest at P?

gravitational potential energy of the car ……J [2]

(ii) What is the kinetic energy of the car when it is at Q?

kinetic energy of the car .....……J [1]

For Examiner's Use

(iii) What is the velocity of the car at Q?

velocity of the car ……m/s [3]

(iv) What is the gravitational potential energy of the car when it is at R?

gravitational potential energy of the car ……J [2]

(b) What is the energy change as the car goes down the slope?

.....[1]

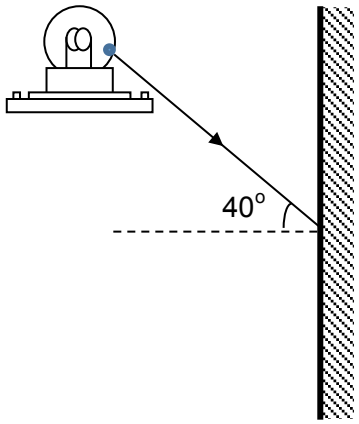
(c) In the real world, energy conversion from one form to another is not always 100%. Suggest what has happened to some of the gravitational potential energy ?

.....

.....[1]

For Examiner's Use

8 The figure below shows a light ray from a lit light bulb hitting the surface of a plane mirror. Consider the light ray as coming from the point on the lit light bulb.



(a) The light ray bounces off the surface of the plane mirror.
What is the name for this change in direction of the light ray?

.....[1]

(b) On the diagram,

(i) mark accurately, with a dot and letter **B**, the position of the image of the bulb,

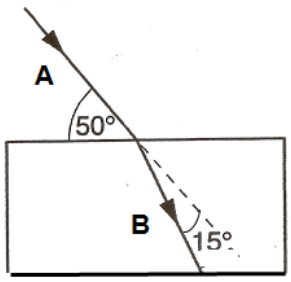
(ii) show the path of the light ray after it bounces off the surface of the plane mirror,

(iii) mark and write the angle of reflection. [3]

(c) State one characteristic of the image formed.

.....[1]

(d) A student traced the path of a light ray through a glass block. The angles that the student measured are shown in the figure below.



(i) Define the term 'refraction'.

.....

.....[1]

For Examiner's Use

(ii) Calculate the angle of incidence and the angle of refraction as the light enters the glass block.

angle of incidence .....º [1]

angle of refraction .....º [1]

(iii) Use the results in **(d)(ii)** to calculate the refractive index of the glass block.

refractive index = ...[2]

9 **(a)** As people get older, many suffer from hearing loss. A hearing aid can help 90% of these people. It picks up sounds and converts them into electrical signals. It then amplifies these signals, converts them back into sounds and sends these sounds into the ear.

(i) Suggest one other cause of hearing loss (other than ageing).

.....[1]

(ii) What are the two energy changes that take place in the hearing aid?

.....

.....[1]

(b) What are two things that a player can do to produce higher notes on a guitar?

.....

.....[2]

(c) Explain why a dog whistle can be heard by dogs, but not by man.

.....

.....[1]

For Examiner's Use

(d) A boy has a weight of 500 N. He puts on a pair of roller skates which has a total area of 0.5 m^2 in contact with the ground. The pressure exerted by the boy wearing the pair of roller skates on the ground is 1300 N/m^2. Calculate the weight of the pair of roller skates.

weight of roller skates = ...N [3]

(e) A wooden block of mass 30 kg being pulled across the floor, at a constant speed by a force of 70 N. The distance moved along the plane is 12.0 m.

Calculate the work done to move the block up the inclined plane.

work done = ...J [2]

- End of Booklet B -

Marking scheme EOY 2014 – Secondary 2 Express

Section A [30m]

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

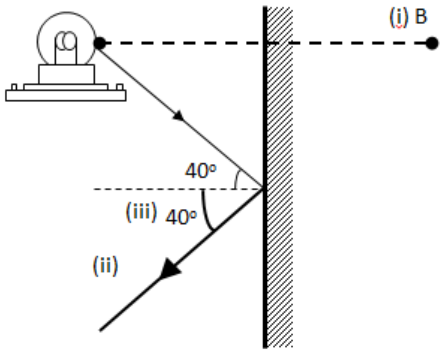
Section B [40m]

1a	The **maximum amount of baking soda** that can dissolved in a **100g of water** at room temperature is **9.5g**.	1
1bi	observation : There will be **solids** in the mixture/ **excess** baking soda remain undissolved. explanation : the concentration of 6g in 50cm^3 of water = 6X2 = 12g/100cm^3, which is greater than the solubility of 9.5g/cm^3 as mentioned in 1(a).	1 1
1bii	Those baking soda that dissolved will be **dissolved at a faster rate**.	1
1biii	Heat/increase the temperature of the mixture/use hot water OR Crush the baking soda into powder	1 1
2ai	Lead foil. The change is reversible. OR The molten silvery grey droplets becomes silvery grey solid again. OR No new substance is formed. OR There is no change in the silvery grey solid after heating.	1 1 OR 1 OR 1 OR 1
2aii	magneisum + oxygen → magnesium oxide OR copper + oxygen → copper oxide	1
2bi	thermal decompositon sugar → water/steam + carbon	1 1
2bii	electrolysis copper chloride → copper + chlorine	1 1
		1
3ai	sulfuric acid, hydrogen	1
3aii	calcium carbonate	2
3aiii	iron nitrate	1
3b	Insert a lighted splint into a test-tube of the gas. The lighted splint extinguishes with a pop sound.	1 1
3c	Egg shell contains calcium carbonate. Vinegar, ethanoic acid, reacted with the shell and dissolved it.	1 1
4a	cliff A	1
4b	2.5 X 330 = 825 m 825 m / 2 = 412.5 m	1 1
4c	4.0 X 330 = 1320 m 1320 m / 2 = 660 m	1 1
4d	412.5 + 660 = 1072.5 m	1 1 OR

	OR (2.5+4.0) X 330 m / 2 = 1072.5 m	1 1
5a	1st : black and rough 2nd : black and shiny 3rd : white and rough 4th : white and shiny (every 2 correct = 1m)	2
5b	Radiation	1
5c	Slow cooling can be achieved by storing the food in a **styrofoam/ plastic box** as these are **poor conductors of heat** and will help to keep the food hot for a longer time. Hot food could be put into a **white and shiny container** as such surfaces are **poor radiators** of heat and will help to keep the food hot for a longer time.	1 1
5d	top part of the room hot air rises, cold air sinks.	1 1
6a	The thermometer in the black tin shows a faster/higher rise in temperature The black tin is a better absorber of heat by radiation compared to the shiny tin.	1 1
6b	The temperature measured at the black tin will decrease rapidly/steeper compared to the temperature measured at the shiny tin. The black tin is a better radiator [1] compared to the shiny tin.	1 1
6c	In solids, the molecules are held in fixed positions, convection currents cannot be set up.	1

Section C [30m]

7ai	GPE = mgh = 150 X 10 X 120 = 180 000 J	1 1
7aii	KE=GPE=180 000 J	1
7aiii	KE = 1/2mv2 = 180 000 0.5 X 150 X v X v = 180 000 $150v^2 = 360\ 000$ $v^2 = 2400$ v = square root of 2400 = 49.0m/s (alternative method to get eventual answer is allowed)	 1 1 1
7aiv	GPE = mgh = 150 X 10 X 30 = 45000 J	1 1
7b	gravitational potential energy → kinetic energy	1
7c	Energy is lost as friction OR sound energy OR heat energy	1

8a	Reflection	1
8b		3
8c	laterally inverted, same size, upright (any one)	1
8di	Refraction is the bending of light as light passes from one medium to another.	1
8dii	angle of incidence = (90-50)° = 40° angle of refraction = (40-15)° = 25°	1 1
8diii	refractive index = sin i/ sin r = sin 40° / sin 25° (method : ECF from 8dii) = 1.52	 1 1
9a(i)	Prolonged exposure to loud sounds.	1
9a(ii)	sound energy → electrical energy electrical energy → sound energy	1 1
9b	Tighten/shorten the string/use a thinner string (any 2)	2
9c	Dog whistle produces sounds outside/above/below man's range of hearing	1
9d	Force = 1300 X 0.5 = 650 N Weight of the skates = 650 – 500 = 150 N	1 1 1
9e	Work done = 70 X 12.0 = 840J	1 1