Class: Sec 2 /	Register No	Name: .....

Pasir Ris Crest Secondary School
Mid-Year Examination 2012
Secondary Two Express

Science (Physics) — **10 May 2012**, **1 hour**

INSTRUCTIONS TO CANDIDATES

Do not open this booklet until you are told to do so.
Write your name, register number and class in the spaces at the top of this page.

Section A (15 marks)

There are **fifteen** questions in this section.
Answer **all** the questions. For each question, there are four possible answers, **A, B, C and D.**
Choose the correct answer and shade accordingly **on the OTAS paper using 2B pencil only.**

Section B (15 marks)
Answer **all** the questions. Write your answers in the spaces provided in the question paper.

Section C (20 marks)
Answer **all** the questions. Write your answers in the spaces provided in the question paper.

For Examiner's Use	
Section A	/ 15
Section B	/ 15
Section C	/ 20
Total	/ 50
Parent's Signature	

This question paper consists of 12 printed pages including this cover page.

My Reflection ... "What was" ....."Why?"....."What next?".....

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Section A - MCQ (15 marks)

Answer ALL questions. Record your answers in the OTAS form provided.

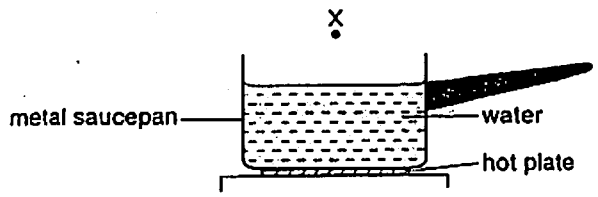
1. Which of the following is the best conductor of thermal energy?

   A Steel
   B Glass
   C Styrofoam
   D Wood

2. Your feet feel warmer on a rug than on your tile floor because your rug is _____.

   A usually warmer than your tile floor
   B a better insulator than your tile floor
   C a better conductor than your tile floor
   D a denser material than your tile floor.

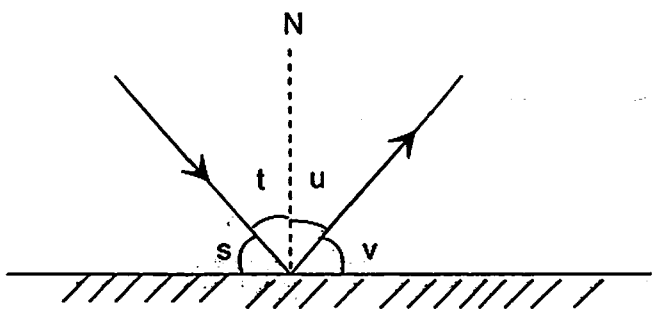
3. The diagram shows a metal saucepan containing water and placed on a hot plate. After some time, the air at point x also becomes hot.



What is the main process by which heat travels from the hot plate through the base of the metal saucepan before reaching the point X?

	Through the base of the saucepan
A	conduction
B	vibration
C	diffusion
D	radiation

4. The diagram shows a light ray reflected off a plane mirror.



Which of the following statements is **true**?

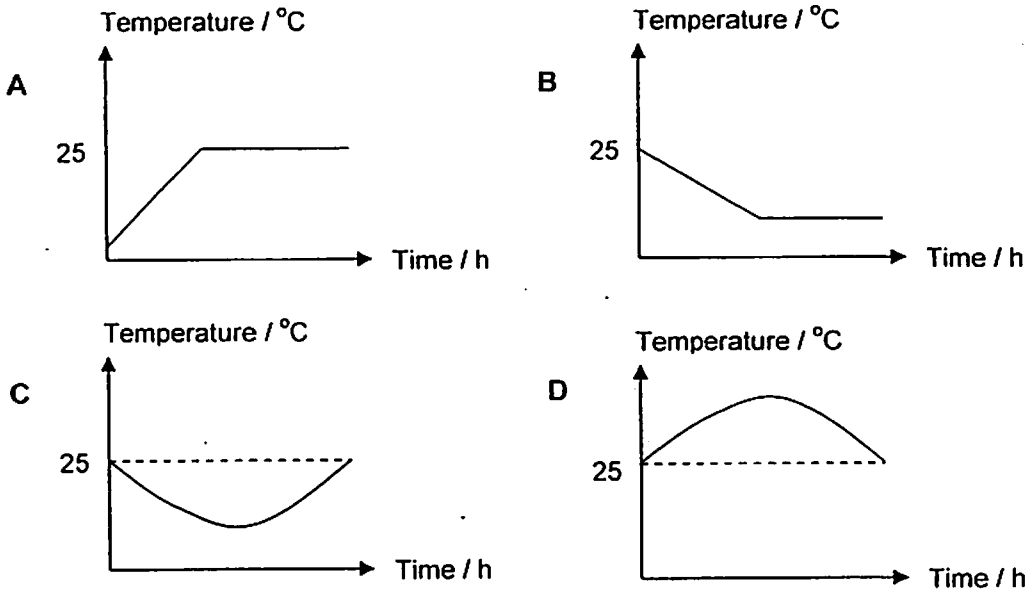
A Angle t is always smaller than angle u.
B Angle s is always equal to angle v.
C Angle u is always equal to angle v.
D Angle v is always bigger than angle t.

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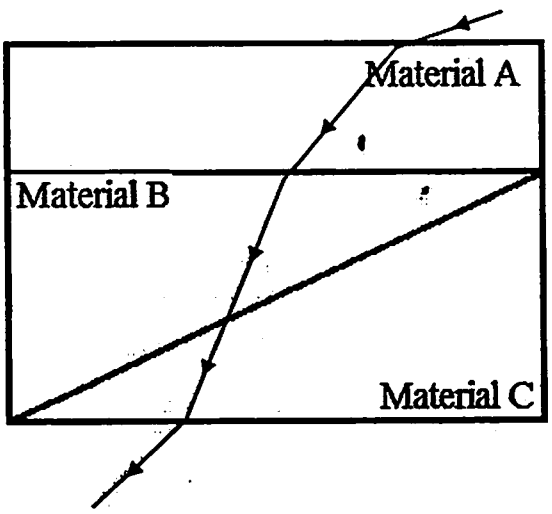
5. In a vacuum, substances absorb heat energy by the process of

A conduction.
B convection.
C radiation.
D all of above.

6. Which of the following graph shows what happens to the temperature of a glass of cold water when placed on a table with a room temperature of 25°C?



7. The diagram below shows the path of light as it passes through 3 different types of materials. Which of the following can be inferred from the diagram?



A Material A is optically denser than Material B.
B Material B is optically denser than Material C.
C Material C is optically denser than Material B.
D Material B and Material C have the same optical density

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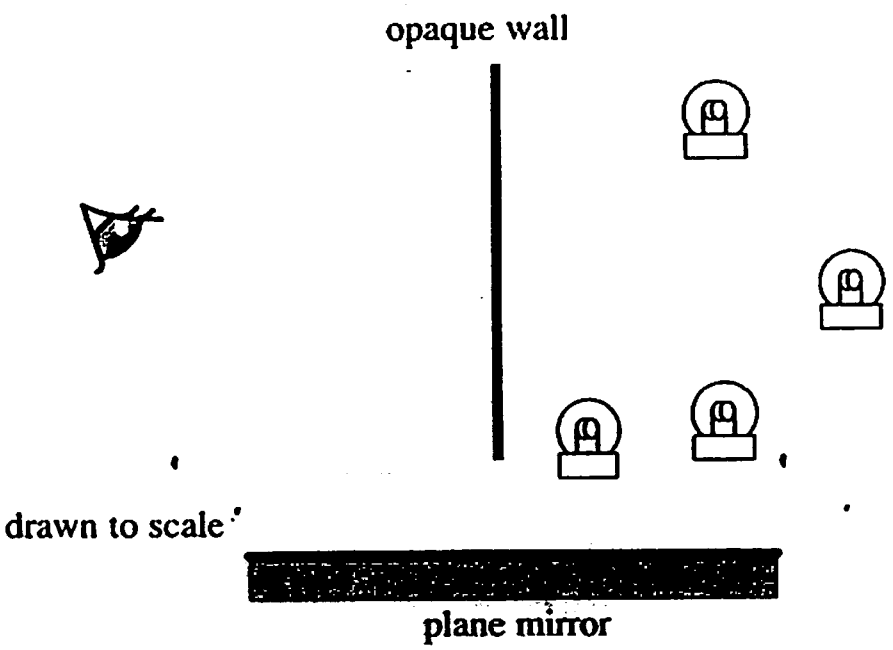
8. If glass expanded more than mercury, then the column of mercury in a mercury thermometer would rise when the temperature

A increase.
B decrease.
C remain the same.
D changes rapidly.

9. Johnson is sitting inside a room lighted with a cyan light bulb and is wearing a red coloured T-shirt. If his friend were to enter the same room, what is the colour of Johnson's T-shirt that his friend will see?

A Blue
B Magneta
C Black
D Red

10. Four light bulbs are concealed from an observer by an opaque wall as shown in the diagram below.



Without shifting the positions of the observer and the bulbs, how many bulbs can the observer see from the mirror?

A 1 B 2 C 3 D 4

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11. Which is/are the condition(s) needed for total internal reflection to take place?

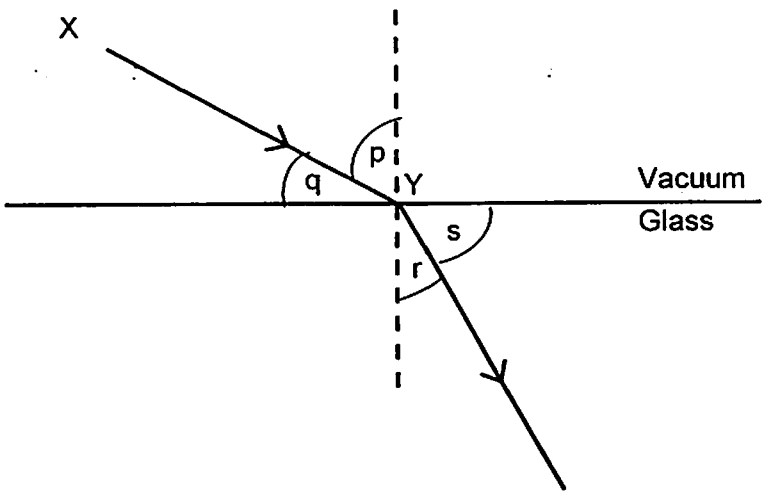
1 Light ray travels from an optically denser medium to an optically less dense medium.
2 The angle of incidence is not 0°.
3 The angle of incidence must be greater than the critical angle.

A 1 and 2 B 1 and 3 C 2 and 3 D 1, 2 and 3

12. During a very cold winter, water pipes sometimes burst. The reason for this is

A the ground contracts when colder, pulling pipes apart.
B water expands when freezing.
C water contracts when freezing.
D the thawing process releases pressure on the pipes.

13. The figure below shows a light ray XY travelling from vacuum to glass.



. What is the refractive index of the glass?

A sin (p) / sin (r) B $\sin^{-1}\{ \sin (p) / (r) \}$
C sin (q)/ sin (r) D $\sin^{-1}\{ \sin (q) / (r) \}$

14. Conduction can occur in _____.

(i) solids
(ii) liquids
(iii) gases

A (i) B (ii) & (iii)
C (i) & (iii) D (i), (ii) & (iii)

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15. Water (i)_____ when cooled to a temperature of 4°C.

Therefore, its density at 4°C is (ii)_____.

	(i)	(ii)
A	Contracts	Decreased
B	Contracts	Increased
C	Expands	Decreased
D	Expands	Increased



End-of-Section A

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Section B (15 marks)

16. a. Eva wrote on her exam paper that *"Unlike solids and liquids, gases do not expand when heated or contract when cooled."* Is this statement correct? Explain your answer with an example.

_____

_____

_____

_____

_____ **[2]**

b. A metal spoon and a plastic spoon are placed on a table in an air-conditioned room. Which spoon will feel colder when being held on the finger? Explain your answer.

_____

_____

_____

_____ **[2]**

17. The image in the mirror is a *virtual* image,

a. list **three other** characteristics of a mirror image.

_____

_____

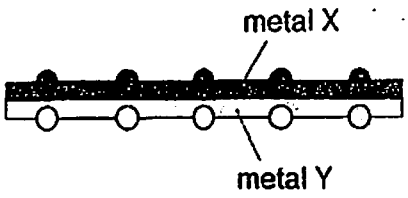
_____ **[3]**

b. explain what is the difference between *real* and *virtual images*.

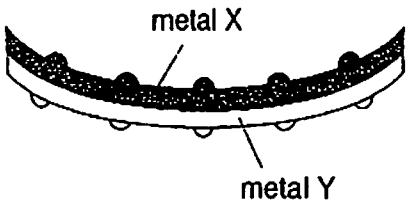
_____ **[1]**

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18. The figures below show a bimetallic strip made of metal X and metal Y, before and after it is being heated by a Bunsen burner for about 10 minutes.



Before heating



After heating

a. Explain why the metallic strip bent after it is being heated by the Bunsen Burner?

_____ [1]

b. Which metal, **X** or **Y**, expands **more** when it is heated?

_____ [1]

c. The metals used to make this bimetallic strip are brass and steel. Given that brass contracts more than steel given the same drop in temperature, identify metal **X** and metal **Y**.

metal **X** is _____ [1]

metal **Y** is _____ [1]

d. Liquid nitrogen is nitrogen in a liquid state at an extremely low temperature. At atmospheric pressure, liquid nitrogen boils at −196 °C and can cause rapid freezing on contact with objects. Draw and label, in the box below, the shape of the bimetallic strip after being in contact with liquid nitrogen for 5 minutes. **[2]**

e. State a useful application for the use of bimetallic strip.

_____ [1]

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Section C (20 Marks)

19. A light ray is incident upon a triangular glass block with a speed of 3×10^8 m/s as shown in the Fig. 19.1 below (not to scale). It was found that the speed of light is two-third that of speed of light in air when it enters the glass block.

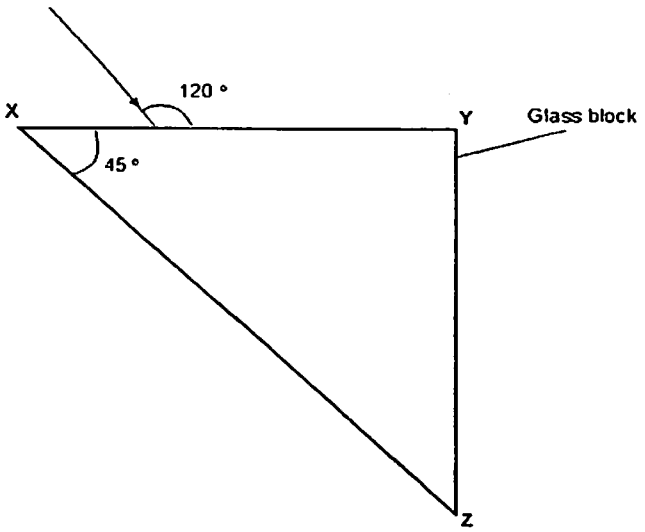


Fig. 19.1

a. Explain what will happen to the light ray as it enters the glass.

_____

_____

_____ [2]

b. Define critical angle.

_____

_____

_____ [1]

c. Determine the refractive index, n, of the glass block. Hence, find the angle of refraction in the glass. [4]

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d. Given that the critical angle of the glass is 42° and that the refracted ray forms an angle of 64.5° with the surface XZ. Draw on Fig 19.2 and complete the path of the light ray until it emerges from the glass into the air again. Clearly label the angle of incidence, angle of refraction and/or angle of reflection at each point of incidence. **[4]**

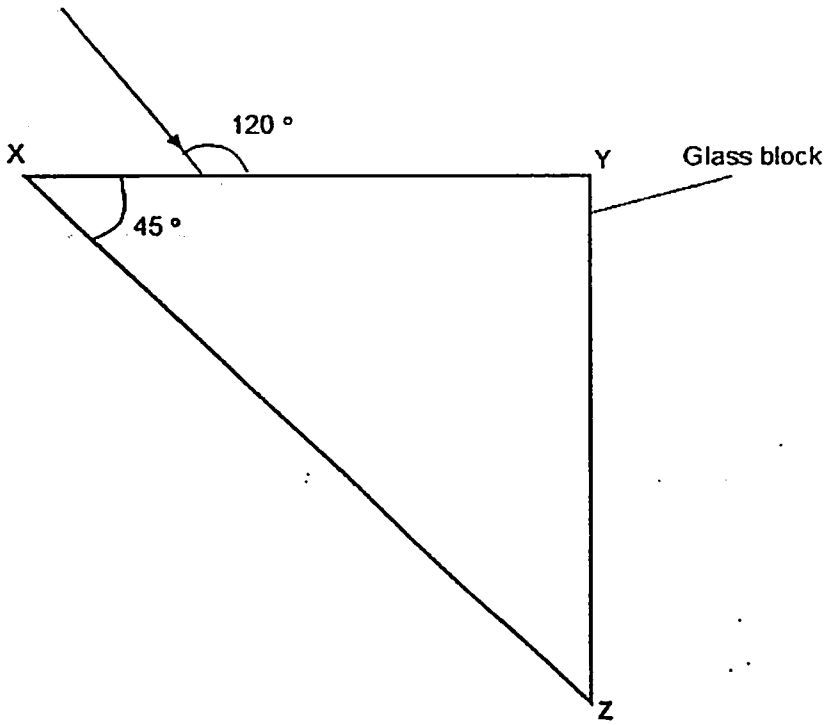
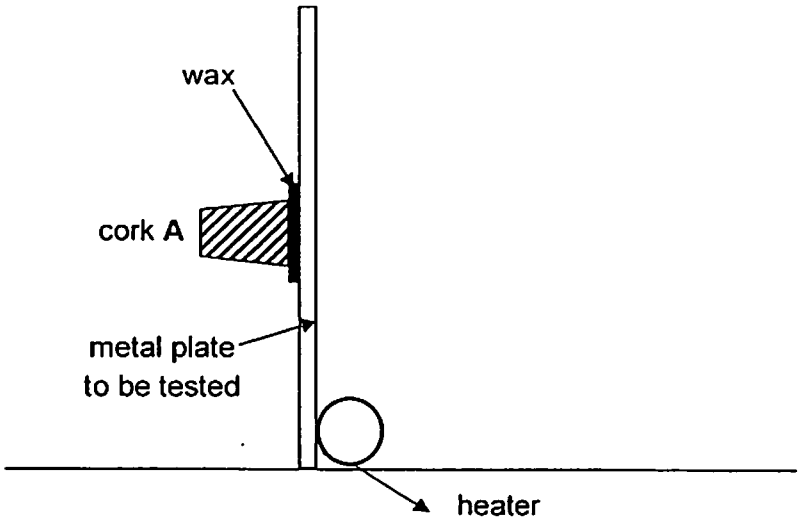


Fig. 19.2

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20. Thermal conductivity is a measure of the ability of a substance to conduct heat. In an experiment, as setup below, a student wants to investigate the relationship between the thermal conductivity of several metallic plates with the duration at which the cork will fall.



The table below shows the metal plates used in the experiment and their respective thermal conductivities:

Materials	Copper	Stainless Steel	Iron	Silver	Brass
Thermal Conductivity, W/(m.K)	400	16	80	429	109

a. Given that the time taken for the cork to fall off Copper and Iron is 20 s and 53 s. What can you infer about the relationship between the thermal conductivity of metallic plates with the duration at which the cork will fall? Explain your answer.

_____

_____

_____ **[2]**

b. Based on your answer in (a), rank the metals that are able to keep the cork intact for the longest to shortest duration:

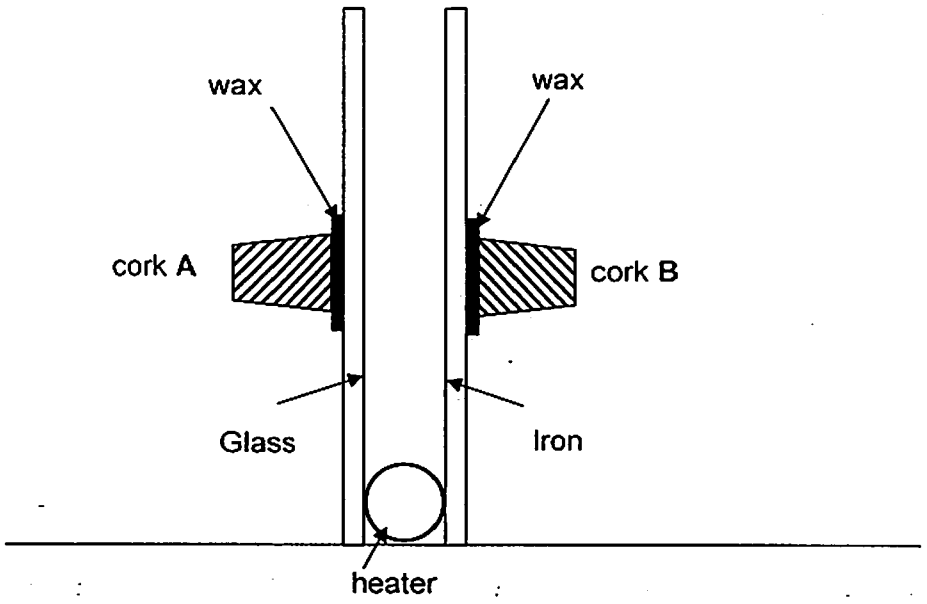
_____

_____

_____ **[2]**

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c. The diagram below shows two plates placed vertically in contact with an electric heater. The plates are exactly identical except for the materials used. Identical corks are attached by thin layers of wax to the surfaces of the plates facing away from the heater as shown. The heater has been switched on for 15 minutes and one cork falls before another.



i. Which cork, A or B, would fall of first? Explain your answer.

[3]

ii. Name the process which is mainly responsible for the heat transfer in the above scenario.

[1]

iii. Identify **two** other variables that must be kept constant in order to ensure a fair experiment is conducted.

[2]

End-of-Paper

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State the experiment to test expansion in solids.

types of Metal rods with wax.

End-of-Paper



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