Name: _____ Index No. _____ Class: _____

Queenstown Secondary School

Secondary Two Express
Mid-Year Examination 2012
Science

4 May 2012
Friday

Time : 0745 - 0930
Duration : 1 hr 45 mins

Instructions to candidates:
DO NOT OPEN THIS BOOKLET UNTIL YOU ARE TOLD TO DO SO.
Write your name, class and registration number on the answer sheet provided.

Section A
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 – the OMS.
At the end of the examination, hand in your answers to Section A separately.

Section B
Answer **all** questions in this section.
Write your answers in the spaces provided on the question paper.

Section C
Answer **all** questions in this section.
Write your answers in the spaces provided on the question paper.

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

A copy of the Periodic Table is attached on the last page.

Examiner's Use	
Section A	
Section B	
Section C	
TOTAL	

This question paper consists of ?? printed pages

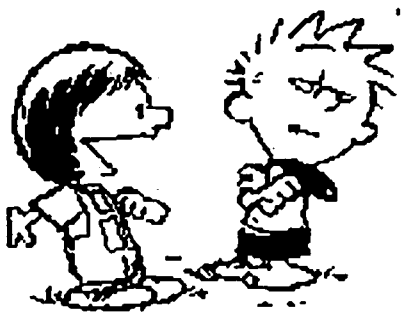
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Section A: Multiple Choice Questions (30 marks)

There are **thirty** questions in this paper. 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. (Take the value of g =10ms^{-2})

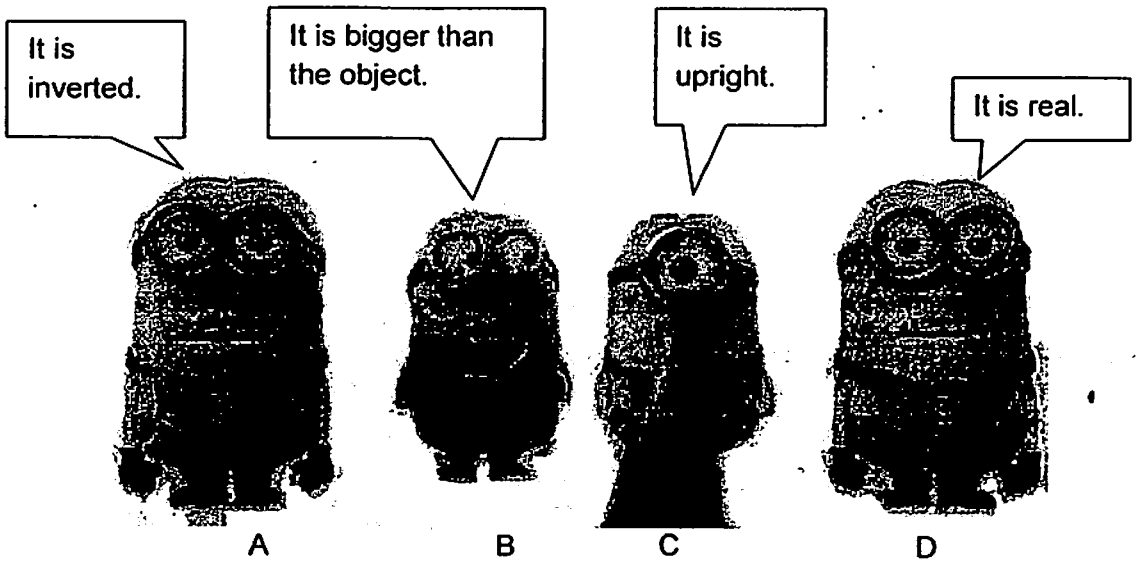
1 Susie wants to explain to Calvin that light travels in straight line.



Which of the following observations below can she use to support her explanation?

A	A straw in water appears bent	**C**	Shadows
B	Formation of rainbows	**D**	Image formed in a mirror

2 Four minions A, B, C and D are each asked to give a property of a mirror image.



Who is correct ?

3 Prince Charming wants to check his appearance but he cannot find a mirror. He needs a surface which can produce regular reflection. Which of the following can he use?

A A basin of water
B A sheet of smooth aluminium
C A piece of rough frosted glass
D Shiny diamond



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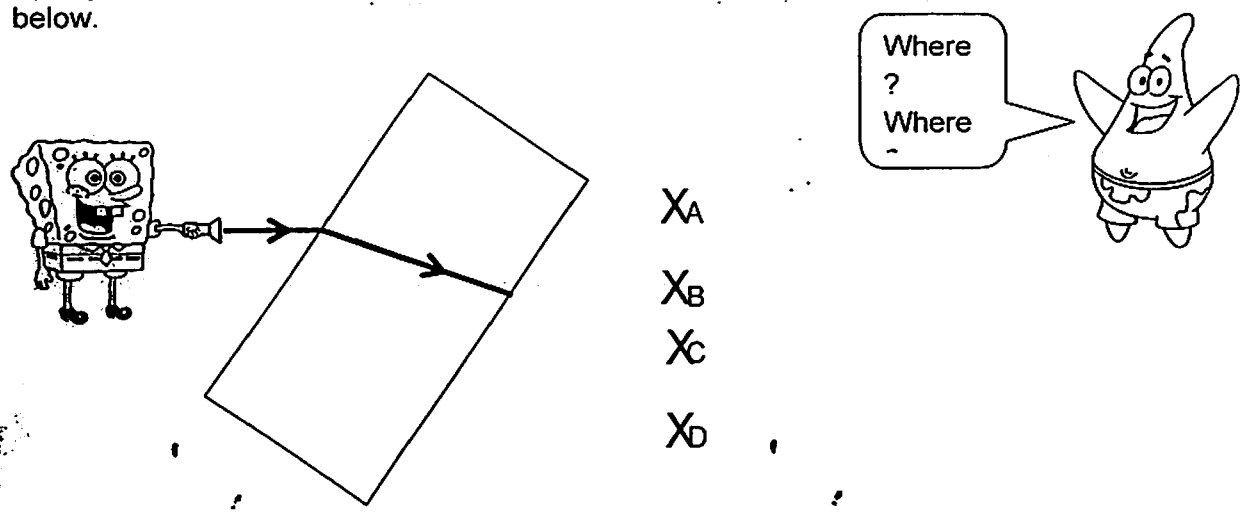
4 Russell asks Carl a question as shown in the diagram below.



How should Carl answer him?

A It's because light always tries not to move in a straight line.
B It's because light changes its speed when it enters the glass.
C It's because light always chooses the shortest path.
D It's because light gains energy when it enters the glass.

5 Spongebob shines a ray of light into a block of glass and the path of light in the glass is shown below.



Where should Patrick stand so that the emergent ray of light will shine onto him?

6 Figure 6 shows Mumble the penguin dancing. What are the energy changes involved?

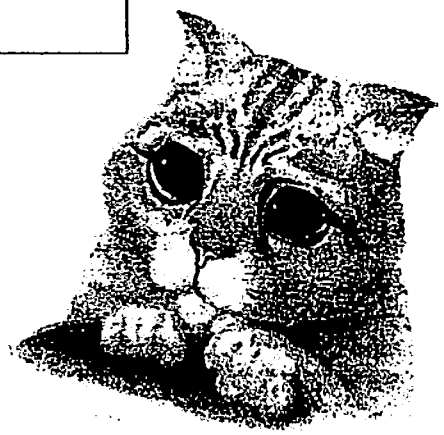


A Chemical potential energy is changed into kinetic energy.
B Elastic potential energy is changed into kinetic energy.
C Kinetic energy is changed into gravitational potential energy.
D Kinetic energy is changed into chemical potential energy.

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7 Puss in boots writes his ideas about energy as shown below and shows them to you.

> 1. I have the ability to do work because I have energy.
> 2. The more energy I create, the more work I can do.
> 3. If I don't like energy, I can always destroy it.



As a Physics student, how many of his statement/s do you think is/are wrong?

A 0 C 2
B 1 D 3

8 Which of the following factors will affect the kinetic energy of an object?

A size of the object C speed of the object
B acceleration due to gravity D shape of the object

9 Jeremy Lin threw a basketball upwards.



Which of the following below describes correctly what happens to the kinetic energy and gravitational potential energy of the ball just before it reaches the highest point?

A It gains both kinetic and potential energy.
B It gains kinetic energy but loses potential energy.
C It gains potential energy but loses kinetic energy.
D It loses both kinetic and potential energy.

10 Megamind needs a renewable source of energy for his new invention. Which of the following sources of energy below can be used?

(I) Fossil fuel
(II) Biomass
(III) Wind
(IV) Sun



A (I), (II), (III) and (IV)
B (I), (III) and (IV)
C (II), (III) and (IV)
D (IV) only

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11 Which would you use to measure exactly 30.5 cm^3 of aqueous hydrochloric acid

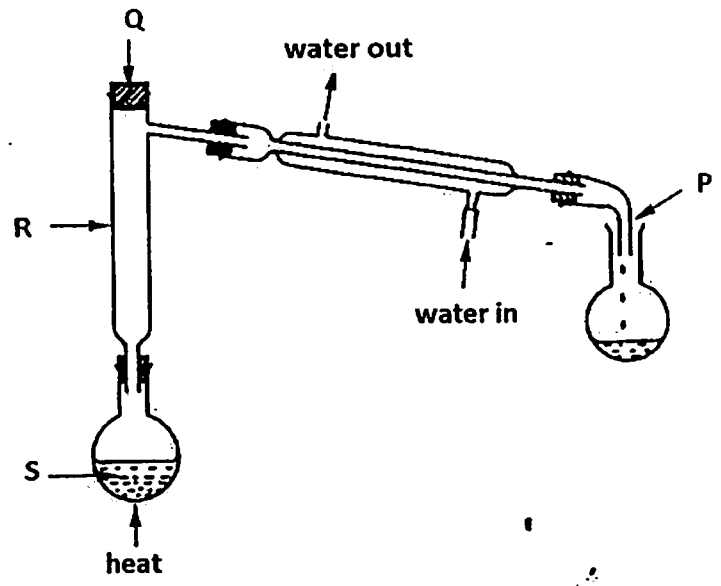
A Burette
B Marked Beaker
C Measuring Cylinder
D Pipette

12 A flask contains liquid chloroform and water. They are separated using a separating

Which conclusion can be made from this observation alone ?

A Chloroform and water are immiscible.
B Chloroform and water have different boiling point.
C Chloroform and water have different solubility.
D Chloroform has a higher density than water.

13 A mixture of two liquids is fractionally distilled in the apparatus shown below.

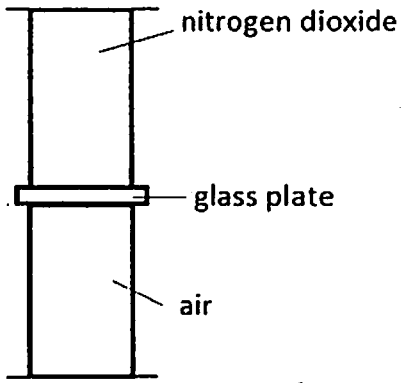


Which one of the following changes would you make to best improve the efficiency of the separation of the liquids ?

A Filling tube R with glass beads.
B Increasing the rate of heating in the distillation flask.
C Inserting a thermometer at Q.
D Putting anti-bumping stones into S.

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14 Nitrogen dioxide is a dark brown gas which is denser than air. A gas jar containing nitrogen dioxide is sealed with a glass plate and is then inverted on top of a gas jar containing air.



The glass plate is then removed. After some time, a uniform light brown colour was seen throughout the gas jars. This was the result of the movement of

A air from outside entering the gas jars.
B air moving upwards into the gas jar at the top.
C nitrogen dioxide molecules and air moving into different gas jars at the same time.
D nitrogen dioxide molecules moving downwards into the gas jar at the bottom.

15 The boiling points of some elements are given in the table.

Element	*Boiling point / °C*
Nitrogen	-196
Xenon	-108
Oxygen	-183

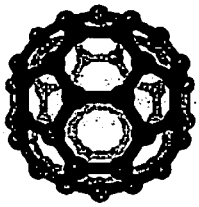
A mixture of nitrogen, xenon and oxygen at -200 °C is allowed to warm up to -150 °C.

Which elements are still in the liquid state at -150 °C ?

A A mixture of nitrogen and oxygen
B A mixture of nitrogen and xenon
C Nitrogen only
D Xenon only

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16 The substance buckministerfullerene was discovered in 1985. It is a perfect sphere with the chemical formula C_{60} as shown below.

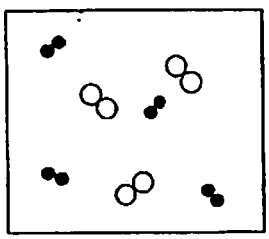


From the above information, what can you deduce about buckministerfullerene ?

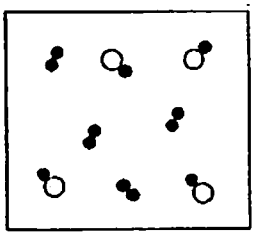
A It only contains one element.
B It is a compound made up of 60 atoms.
C It is a mixture of 60 atoms.
D It is a mixture of 60 elements.

17 Which diagram shows a mixture of one element and one compound ?

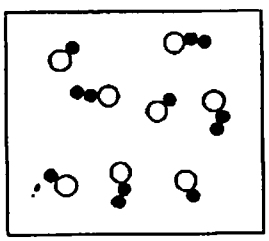
A



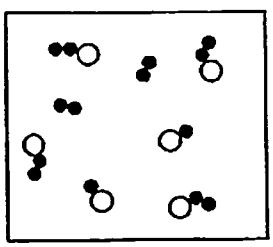
C



B



D



18 Which pair of atoms contain the same number of neutrons ?

A $^{114}_{48}Cd$ and $^{119}_{50}Sn$
B $^{59}_{27}Co$ and $^{59}_{28}Ni$
C $^{133}_{55}Cs$ and $^{132}_{54}Xe$
D $^{63}_{29}Cu$ and $^{65}_{29}Cu$

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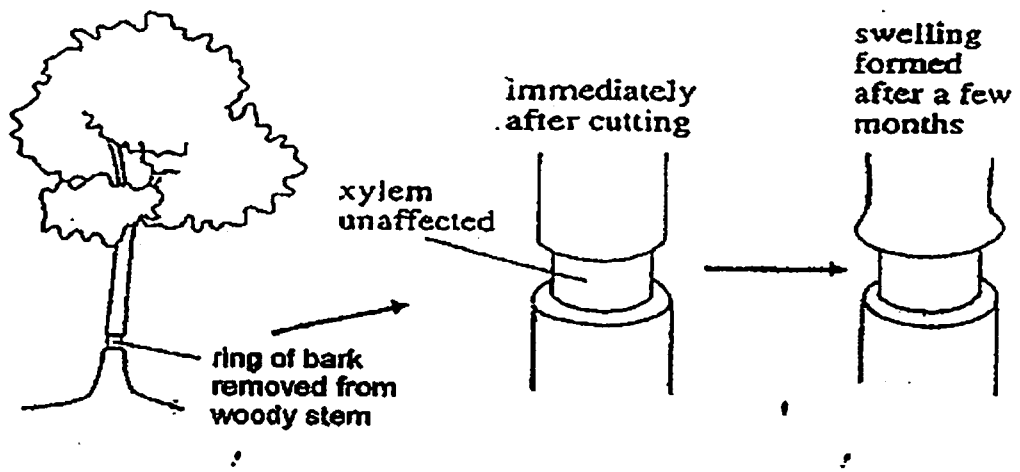
19 Which of the following elements has the greatest number of electrons in the valence (outermost) shell of its atoms ?

A Helium
B Fluorine
C Potassium
D Silicon

20 Element Z may be presented by $^{59}_{28}Z$. What is the structure of the ion Z^{2+} ?

	Protons	*Neutrons*	*Electrons*
A	28	31	28
B	28	31	26
C	28	31	30
D	28	29	28

Questions **21** and **22** refer to an experiment in which a ring of bark was removed from a woody stem and left to grow with sufficient light and water. The diagram below represents the experiment and shows the appearance of the plant after a few months.



21 The swelling is most likely caused by _____.

A accumulation of water
B accumulation of food
C growth of xylem
D decomposers acting on the tissues

22 This plant will soon die because _____.

A water cannot reach the leaves
B mineral salts cannot be transported along the stem
C sugars cannot be transported to the roots
D no carbohydrate is stored in the roots

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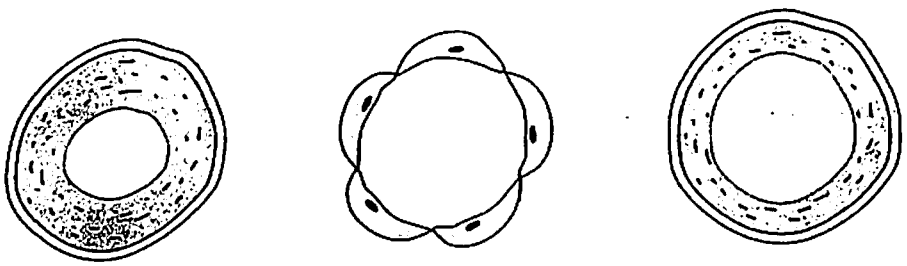
23 How do nitrate ions, oxygen and water enter root hair cells?

	Active Transport	Diffusion	Osmosis
A	Mineral salts	Oxygen	Water
B	Mineral salts	Water	Oxygen
C	Oxygen	Mineral salts	Water
D	Oxygen	Water	Mineral salts

24 Which of the following explains the presence of white blood cells near a damaged tissue.

A To stop bleeding by clotting.
B To transport more oxygen to the cells of damaged blood vessel.
C To transport waste material to the excretory organ for removal.
D To fight bacteria which might have entered the bloodstream.

25 The diagrams show the different types of blood vessels P, Q and R.



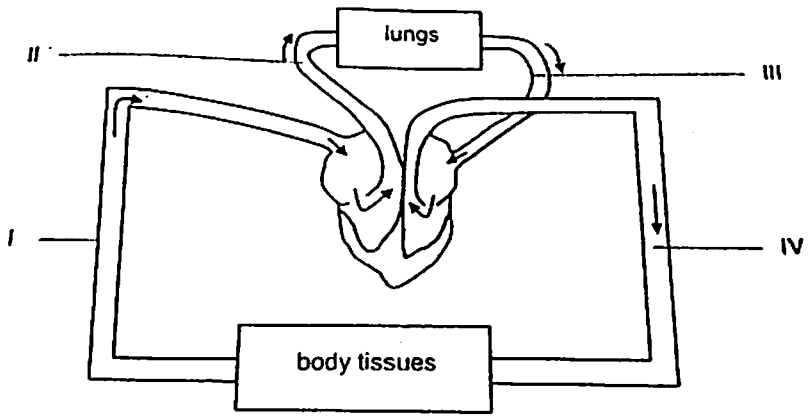
P Q R

Which of the following features is correct for each vessel?

	Require valves to aid the blood flow	Substances can pass through the wall	Blood under high pressure
A	P	Q	R
B	R	P	Q
C	R	Q	P
D	Q	R	P

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26 The diagram below shows a plan of the circulatory system.



Which blood vessel contain the highest concentration of oxygen and carbon dioxide respectively?

	Oxygen	Carbon Dioxide
A	I	II
B	I	III
C	II	IV
D	III	II

27 In the human alimentary canal, carbohydrates are digested as indicated below.

$$\text{Starch} \xrightarrow{\text{Enzyme 1}} \text{Maltose} \xrightarrow{\text{Enzyme 2}} \text{Glucose}$$

Which of the following represents **enzyme 1** and **enzyme 2** correctly?

	Enzyme 1	Enzyme 2
A	Amylase	Lipase
B	Amylase	Maltase
C	Lipase	Pepsin
D	Maltase	Amylase

28 In which part of the digestive system is carbohydrate digested?

A The small intestine and large intestine
B The stomach and the small intestine
C The mouth and the small intestine
D The mouth and the stomach

29 Runners take glucose drinks before races because glucose drinks _____.

A contain sugar which acts as food and eases the process of digestion
B have more sugar and less water, thus prolong urination
C can be directly absorbed by the body very quickly and provides instant energy to run
D has enzymes which help them run faster

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30 Which of the following statements about enzymes are **correct** ?

I: Enzymes function best at body temperature.
II: Enzymes speed up the process of digestion.
III: The body gets enzymes from food.
IV: Digestion cannot take place without enzymes

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

Name: _____( )

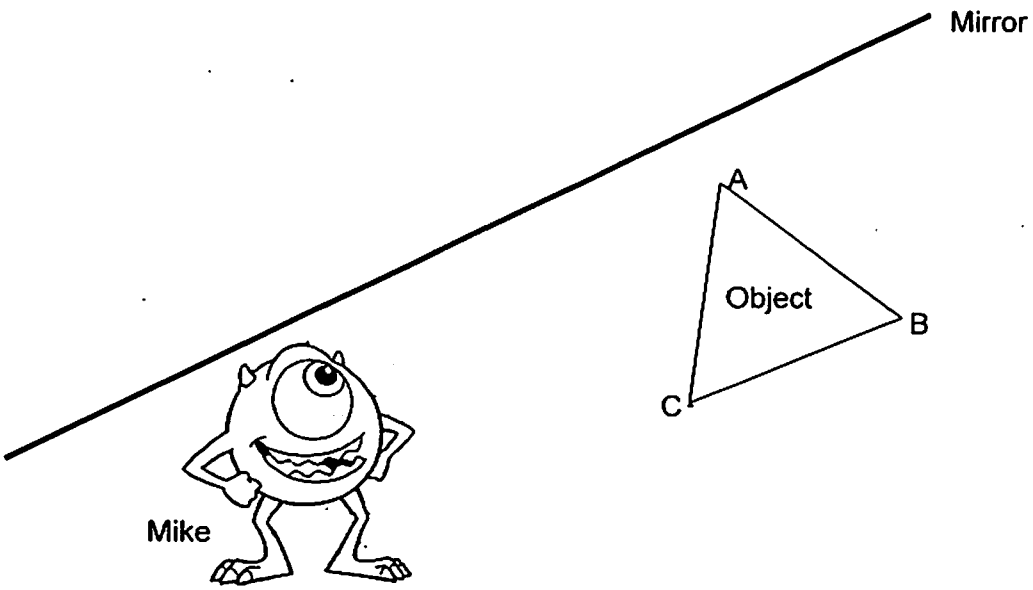
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Total	
Section B	
Section C	

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

1 The diagram below shows Mike and a triangular object in front of a mirror.



(a) Locate and draw the mirror image of the triangular object ABC. [2]

(b) Draw light rays to show the eye of Mike sees the **image of point C**. [2]

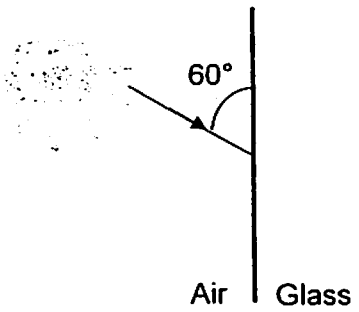
(c) A mirror image is virtual. Explain the meaning of virtual image. [1]

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2 The diagram below shows a ray of light from the sun incident on a glass window surface.



(a) State the angle of incidence ..... [1]

(b) Given that the refractive index of the glass is 1.51, calculate the angle of refraction. State the formula which you use clearly. [3]

(c) Describe one effect of refraction of light in everyday life. [1]

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3

(a) Select, from the following list, one method by which each of the following may be separated from the stated mixture. [5]

You may use a method once, more than once, or not at all.

Chromatography	*Evaporation to dryness*	*Magnetism*
Crystallisation	*Fractional distillation*	*Use of separating funnel*
Distillation	*Filtration*	

(i) Iron fillings and sand .....

(ii) Heptane (boiling point 98 °C) and Octane (boiling point 126 °C)

.....

(iii) Salt from a salt solution .....

(iv) Pure water from a solution of water and food dyes .....

(v) Olive oil from water .....

(b) Describe the experimental steps involved in obtaining sugar from a sugar solution. [2]

(i) .....

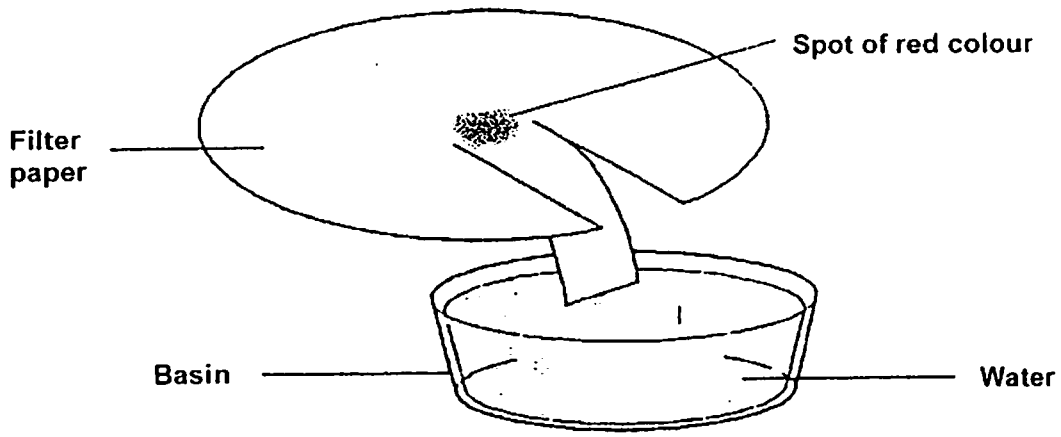
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(ii) .....

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4 Some sweets and candies are coloured red by a mixture containing three dyes. The apparatus in the diagram is used to analyse the mixture.



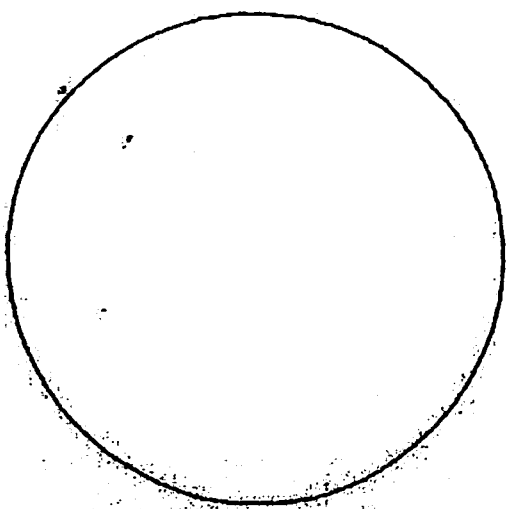
(a) What solvent is being used ? [1]

.....

(b) Explain why a strip of the filter paper is made to dip into the liquid. [1]

.....

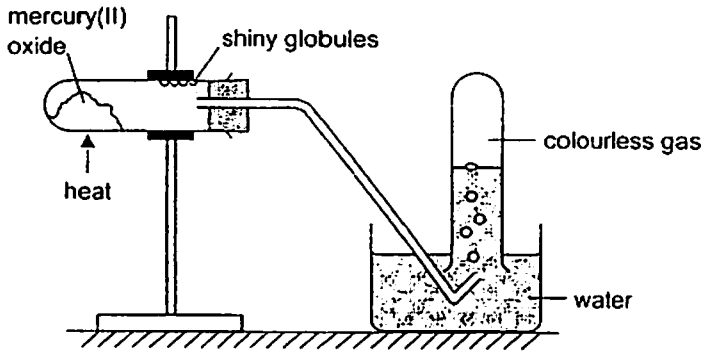
(c) Draw in the diagram below how you would expect the filter paper to appear after several minutes. [1]



Filter Paper

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5 The set-up below shows the heating of mercury (II) oxide, HgO. Mercury (II) oxide is an orange solid at room temperature.



The results are summarized below:

- Shiny silvery globules obtained.
- A colourless gas collected.

(a) Name the **metallic** element in mercury (II) oxide. [1]

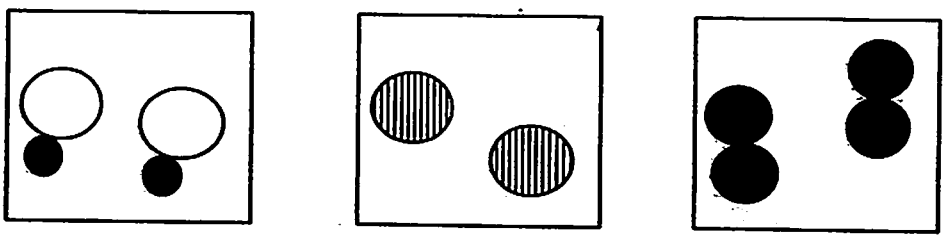
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(b) Name the **non-metallic** element in mercury (II) oxide. [1]

.....

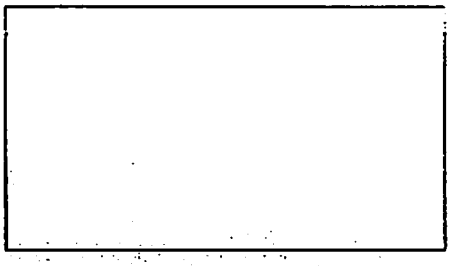
(c) Draw a particle model of the non-metallic element named in **(b)**. [1]

Some examples of particle models are shown below:



Hydrogen chloride gas | Neon gas | Hydrogen gas

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Particle Model for the Non-Metallic Element in **(b)**

(d) Give **one** reason, based on the results obtained, why mercury (II) oxide is a compound. [1]

.....

.....

(e) State two **differences** between steel (a mixture of iron and carbon) and iron carbide (Fe_3C). [2]

(i)

.....

.....

(ii)

.....

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6 The table shows the atomic structure of 6 particles, represented by the letters A to F.

The particles are atoms or ions. The letters are not symbols of the elements.

Particle	*Electrons*	*Protons*	*Neutrons*
A	6	6	6
B	2	2	2
C	12	12	12
D	10	12	12
E	6	6	8
F	10	13	14

Use the letters **A** to **F** to answer the following questions.

(a) Which **two** particles are ions ? [1]

..... and .....

(b) Which particle exists as a noble gas ? ..... [1]

(c) Which **two** particles are an atom and an ion of the same element ? [1]

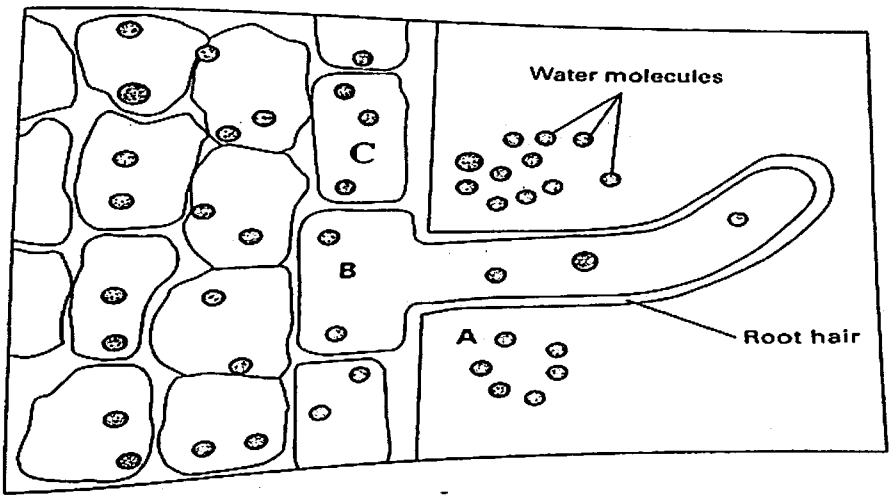
..... and .....

(d) Which **two** particles are isotopes of the same element ? [1]

..... and .....

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7 The figure below shows a section of the root of a green plant.



(a) Name the process by which water at **region A** moves into **Cell B** and then to **Cell C** and explain how the process takes place. [3]

.....

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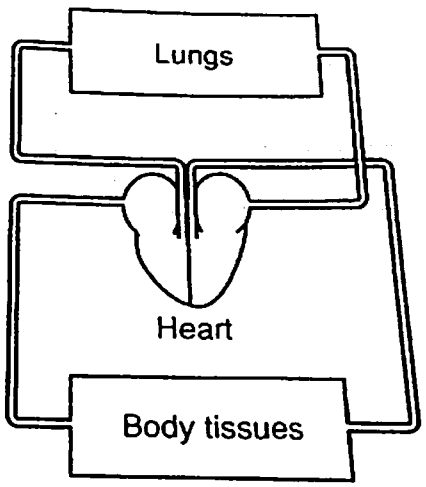
.....

(b) Apart from water name another substance found in **region A** which can be absorbed into **Cell B.** [1]

.....

10 The diagram below shows a cross-section of a human heart.

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(ai) Draw arrows in the diagram to show blood circulation in the body. [1]

(aii) Briefly describe how the blood circulates around the body. [2]

.....

.....

.....

(aiii) How is the blood circulation in humans different from that in fishes? [1]

.....

.....

(b) Name two major components that make up blood and state their functions. [2]

.....

.....

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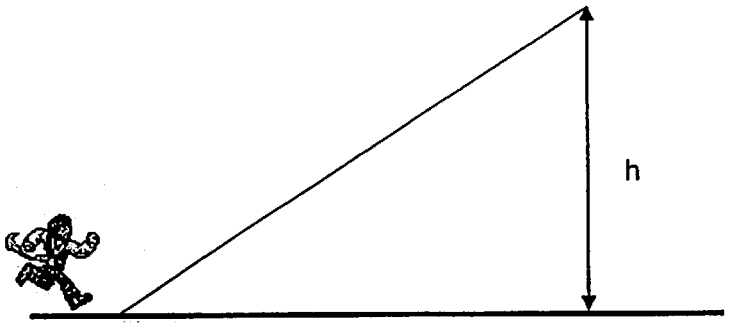
Section C

(30 marks)
Answer all questions.
Write your answers in the space provided on the question paper.

1

(a) Jack Sparrow follows a treasure map and runs towards the treasure. He comes to a slope and runs up.



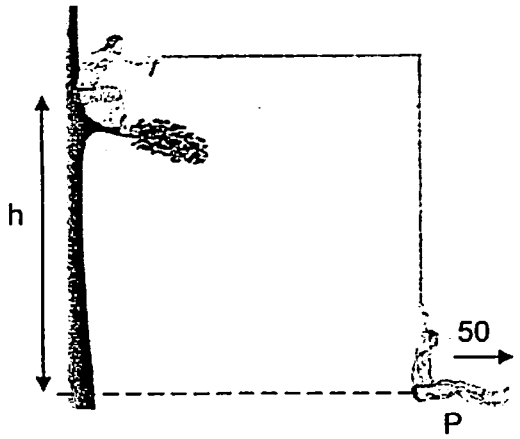


(i) If he has a mass of 70 kg and gains a gravitational potential energy of 105 000 J, calculate the height h of the slope. (Take g = 10 m s^{-2}). [2]

(ii) When Jack Sparrow reaches the top of the slope, he continues his run. After running for some time, he gains a kinetic energy of 3500 J. Without considering the answer for part (a), calculate his speed at this instant. [2]

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(b) Tarzan takes a vine and swings to the other side.





(i) Given that Tarzan has a mass of 60 kg and he achieves a speed of 50 m/s at the lowest point of the swing, P, calculate the amount of kinetic energy gain by him. [2]

(ii) From the answer in (i), calculate the height h which he falls to reach P. [3]

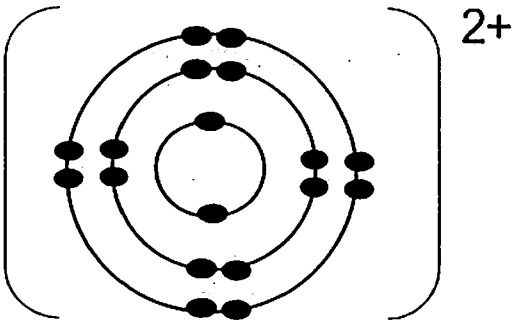
(iii) The amount of kinetic energy gained by Tarzan when he falls to point P is actually less than the calculated value in part (i). State one possible way in which energy is lost during the swinging. [1]

.....

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2

(a) The following diagram shows the electronic structure of an **ion** of an atom.



Using the Periodic Table, [3]

(i) Identify the element. .....

(ii) State its nucleon number. .....

(iii) State the number of valence electrons present in the element.

.....

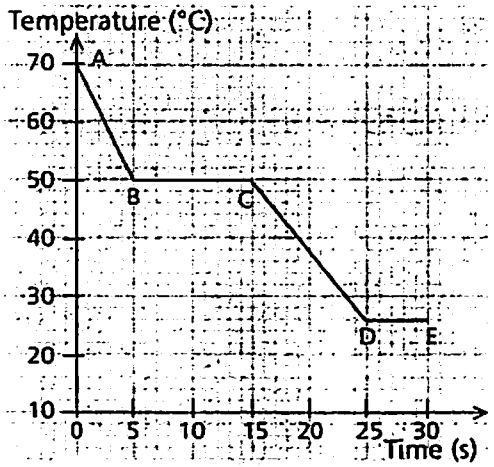
(iv) Describe how the ion above was formed from its atom. [1]

.....

(v) Draw a diagram to illustrate the electronic structure of the **atom** of this element. [1]

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(b) A hot liquid **X** was allowed to **cool** in air. The temperature was measured every five seconds. The graph below represents the cooling curve of **X**.



(i) State the boiling point of **X**. [1]

.....

(ii) Compare the **arrangement** and **movement** of the particles of **X** at 20 °C (solid state) and 150 °C (gaseous state) respectively by completing the table below. [2]

	At 20 °C (solid state)	*At 150 °C (gaseous state)*
Arrangement of particles		
Movement of particles		

(iii) Draw a diagram to illustrate the **arrangement** of particles of **X** at 35 °C. [1]

(iv) In which parts of the graph is energy being given out to the surrounding ? [1]

..... and .....

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The Periodic Table of the Elements

Group																
I	II										III	IV	V	VI	VII	0
						1 H hydrogen 1										4 He helium 2
7 Li lithium 3	9 Be beryllium 4	Key: relative atomic mass / atomic symbol / name / atomic number									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	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
†90-103 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

The volume of one mole of any gas is 24 dm^3 at room temperature and pressure (r.t.p.).

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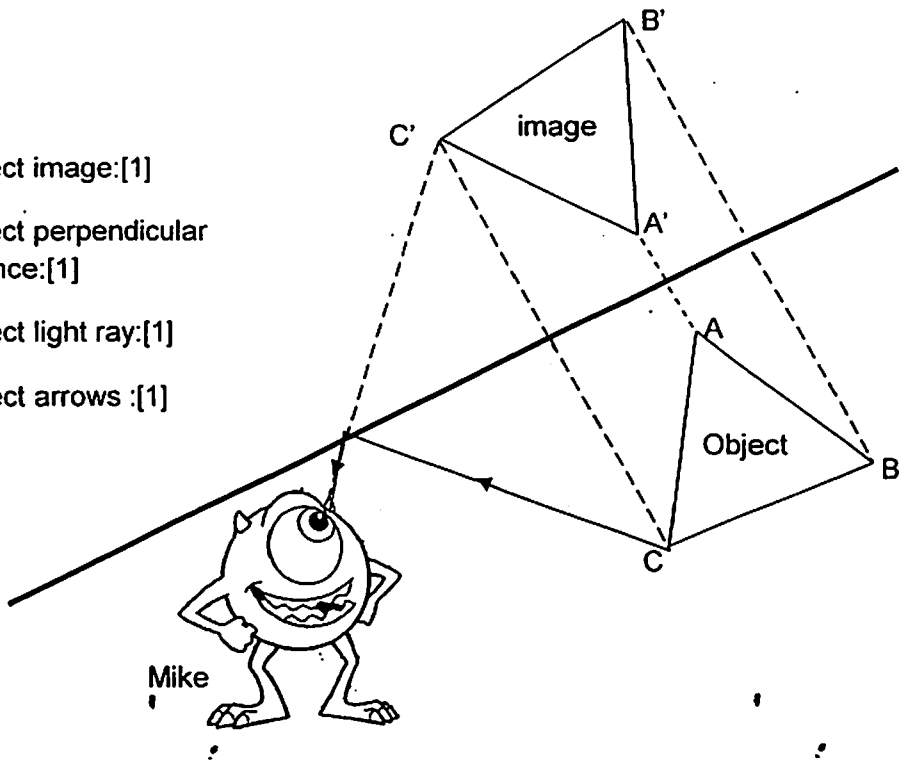
ANSWER SCHEME for Physics

MCQ:

1	2	3	4	5	6	7	8	9	10
C	C	B	B	B	A	B	C	A	C

Section B

1.



a) Correct image:[1]

Correct perpendicular distance:[1]

b) Correct light ray:[1]

Correct arrows :[1]

c) A virtual image is an image that cannot be formed on a screen. [1]

2a) 30° [1]

b) n = sin i/sin r [1]

1.51 = sin 30°/sin r [1]

sin r = 0.331

r = 19.3° [1]

c) An object in water will appear nearer than it actually is. [1]

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Any logical answer.

Section C

1. a)(i) $E_p = mgh$

$105\,000 = 70 \times 10 \times h$ [1]

$h = 150$ m [1]

(ii) $E_k = \frac{1}{2}mv^2$

$3500 = \frac{1}{2} \times 70 \times v^2$ [1]

$v^2 = 100$

$v = 10$ m/s [1]

b) (i) $E_k = \frac{1}{2}mv^2$

$= \frac{1}{2} \times 60 \times 50^2$ [1]

$= 75\,000$ J [1]

(ii) From conservation of energy,

E_p at top = E_k at the bottom [1]

$mgh = 75\,000$

$60 \times 10 \times h = 75\,000$ [1]

$h = 125$ m [1]

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