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Name	()	Class
 SERVE LEAD EXCEL GREENDALE SECONDARY SCHOOL Preliminary Examination 2015		
SCIENCE (PHYSICS / CHEMISTRY)		5076/01
Paper 1 Multiple Choice Secondary 4 Express / 5 Normal Academic		12 Aug 2015 1 hour
Additional Materials Multiple Choice Answer Sheet		

READ THESE INSTRUCTIONS FIRST

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

Write in soft pencil

Write your name, class and register number in the spaces on the top of this page and on the Answer Sheet in the spaces provided.

Do not use staples, paper clips, glue or correction fluid

There are forty questions on 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.

Read the instructions on the Answer Sheet very carefully.

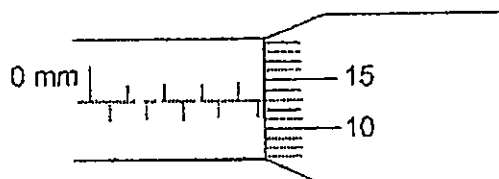
Each correct answer will score one mark. A mark will not be deducted for a wrong answer.
Any rough working should be done in this question paper.

A copy of the Data Sheet is printed on page 8.

A copy of the Periodic Table is printed on page 9.

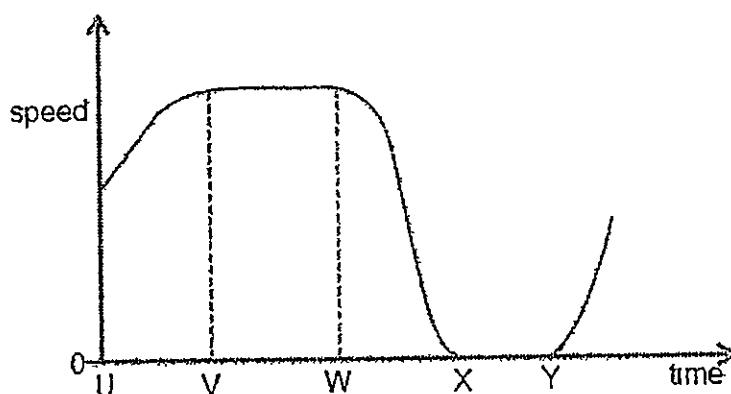
The use of an approved scientific calculator is expected, where appropriate.

- 1 The diagram below shows part of a micrometer screw gauge which is used to measure the thickness of a metal plate



What is the thickness of the metal plate measured by the micrometer?

- A 4.13 mm B 4.63 mm C 4.63 mm D 9.13 mm
- 2 The graph shows how the speed of a car changes with time



Between which two times did the car cover the maximum distance?

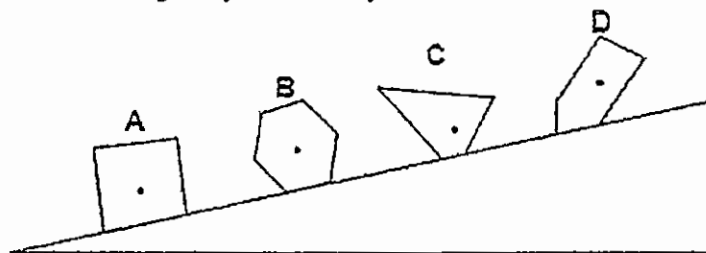
- A UV B VW C WX D XY
- 3 A block of mass 8.0 kg is pulled across a rough surface at a constant speed by a force of 40 N



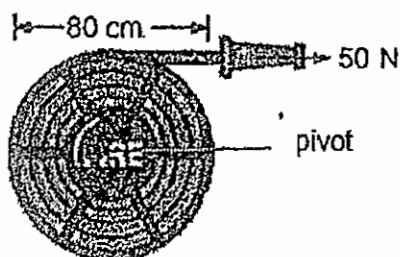
What is the magnitude of the frictional force F ?

- A 5 N B 8 N C 40 N D 80 N

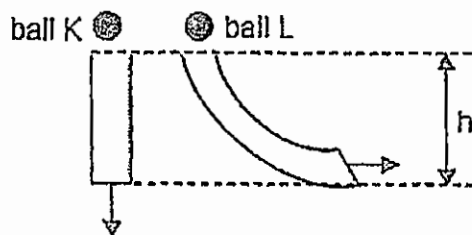
- 4 The diagram below shows four objects placed on a slope. The dot in each object indicates its centre of gravity. Which object is the most unstable?



- 5 A man pulls the hose-pipe with a force of 50 N. The diameter of the hose reel is 80 cm. What is the clockwise moment exerted on the hose reel?



- A 0 Nm B 20 Nm C 40 Nm D 400 Nm
- 6 An elephant of mass 5000 kg stands on four legs, each having an area of contact of 0.25 m^2 . What is the pressure exerted by the elephant on the ground?
- A 20 kPa B 50 kPa C 100 kPa D 200 kPa
- 7 Two balls of equal mass are dropped from the same height down frictionless chutes that reach the ground as shown below. Which of the following is true of the kinetic energy of the two balls as they emerge from the chutes?

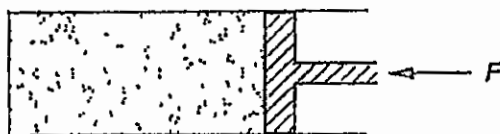


- A Kinetic energy of ball K is equal to that of ball L.
B Kinetic energy of ball K is greater than that of ball L.
C Kinetic energy of ball K is less than that of ball L.
D Kinetic energies of ball K and ball L have decreased.

- 8 When ice melts to become water, which force must be overcome?
- A The attraction between the electrons and the nucleus
 - B The attraction between the atoms in a molecule
 - C The force between molecules
 - D The force of gravity
- 9 A beaker of water is heated at the bottom to form convection current in the water. An explanation on how convection occurs contains four statements
- 1 Density of expanded water decreases
 - 2 Warm water that is less dense rises and cold water moves in to replace it
 - 3 Water at the bottom gains heat and becomes warmer
 - 4 Water expands

What is the correct order of these four statements?

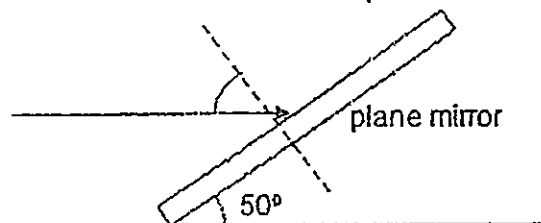
- A $3 \rightarrow 1 \rightarrow 2 \rightarrow 4$
 - B $3 \rightarrow 2 \rightarrow 4 \rightarrow 1$
 - C $3 \rightarrow 4 \rightarrow 1 \rightarrow 2$
 - D $3 \rightarrow 4 \rightarrow 2 \rightarrow 1$
- 10 A quantity of gas is trapped in a container by a piston exerting a force F . The temperature of the gas is raised while F remains unchanged.



Which statement is correct?

- A The gas expands
 - B The molecules get larger
 - C The piston remains in the same place
 - D The speed of the molecules decreases
- 11 A hospital needs to sterilise medical equipment. Which electromagnetic waves could be used?
- A infra-red B microwaves C radiowaves D ultra-violet

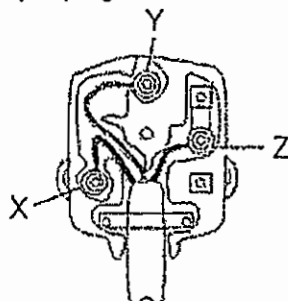
- 12 A light ray is parallel to the floor and strikes a plane mirror as shown



What is the angle of incidence?

- A 40° B 50° C 90° D 140°
- 13 The diagram below shows a light ray travelling from air into a glass block. If the refractive index of the glass is 1.42, what is the angle of refraction of the light ray?
-
- A 18.3° B 29.9° C 31.7° D 45.0°
- 14 A ball was thrown vertically upwards with a speed of 3 m/s. The ball reached a highest point before falling down to the ground. What is the acceleration of the ball at the highest point?
- A 0 m/s^2 B 3 m/s^2 C 10 m/s^2 D 30 m/s^2
- 15 A cell will deliver 6000 J of energy to a 4 W electric motor before the cell is exhausted. What is the duration the motor will be running?
- A 25 mins B 100 mins C 1500 mins D 6000 mins
- 16 A conductor of resistance R has cross sectional area A and length L . What would have been the resistance if the conductor now has both the area and the length doubled?
- A $0.5 R$ B R C $2 R$ D $4 R$
- 17 Which of the following is correct with regard to soft iron when it is demagnetised?
- A attracted by one end of a magnet and repelled by the other
B attracted by both ends of a magnet.
C repelled by another piece of soft iron
D repelled by both ends of a magnet.

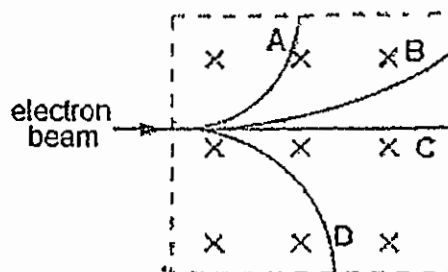
- 18 The diagram shows a three-pin plug used with a 15 A fuse



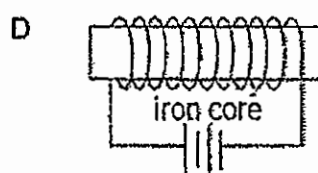
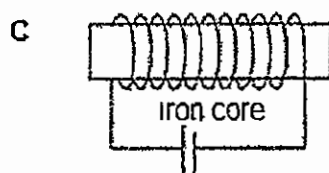
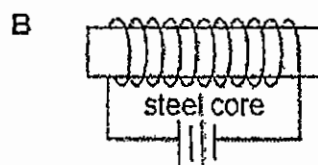
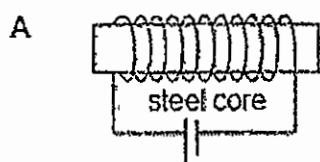
Which row shows the possible values of the current flowing through the terminals X, Y and Z when there is no fault?

	current at X / A	current at Y / A	current at Z / A
A	0	9	9
B	9	0	10
C	9	0	9
D	9	9	9

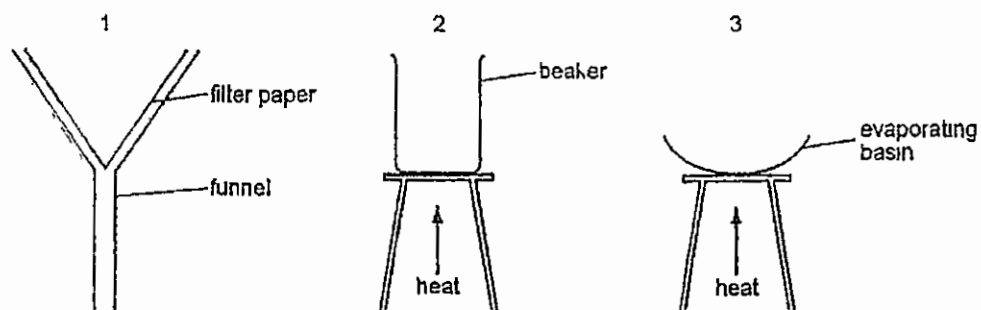
- 19 An electron beam enters a uniform magnetic field as shown in the diagram below. Which is the correct path of the electron beam?



- 20 Which of the following is the strongest electromagnet?



- 21 The diagrams show three sets of apparatus.



What apparatus would be used to obtain separate samples of sand and salt from a mixture of sand and seawater?

- A 1 only B 1 and 3 C 2 and 3 D 3 only

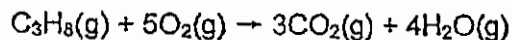
- 22 The symbol for an ion of X is ${}^{40}_{19}\text{X}^+$. What do the numbers 19 and 40 represent for an ion of X?

- | | <u>number 19</u> | <u>number 40</u> |
|---|-------------------------|------------------------|
| A | the number of electrons | the number of neutrons |
| B | the number of electrons | the number of nucleons |
| C | the number of protons | the number of neutrons |
| D | the number of protons | the number of nucleons |

- 23 Element X has an electronic structure 2.8.5. Element Y has an electronic structure 2.8.6. What is made when X and Y react?

- | | <u>type of compound</u> | <u>formula</u> |
|---|-------------------------|------------------------|
| A | covalent | X_2Y |
| B | covalent | X_2Y_3 |
| C | ionic | X_2Y |
| D | ionic | X_2Y_3 |

- 24 Propane burns completely in oxygen as shown in the equation



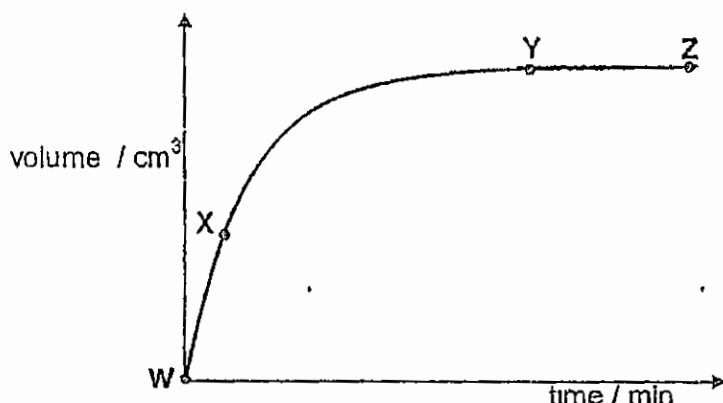
If 0.1 mol of propane is burnt completely, what is the volume of carbon dioxide obtained, measured at room temperature and pressure?

- A 0.1 dm³ B 0.3 dm³ C 3.0 dm³ D 7.2 dm³

- 25 A thermometer is placed in water and the temperature shows 30.5°C . An endothermic change takes place as a solid is dissolved in the water. The temperature changes by 4.5°C . What is the final temperature?

A 25.0°C B 26.0°C C 35.0°C D 39.5°C

- 26 The graph shows the total volume of hydrogen gas evolved, plotted against time, when magnesium reacts with excess hydrochloric acid of 2 mol/dm^3 .



Which statement is correct?

- A The reaction is faster at point X than at point W.
B The reaction first reaches completion at point Y.
C The time taken to reach completion decreases if 1 mol/dm^3 hydrochloric acid is used.
D The total volume of hydrogen gas evolved is greater if 4 mol/dm^3 hydrochloric acid is used.
- 27 The table shows the results of adding dilute hydrochloric acid and aqueous sodium hydroxide to 4 different oxides. Which oxide is amphoteric?

oxide	result of adding	
	dilute hydrochloric acid	aqueous sodium hydroxide
A	no reaction	reaction
B	no reaction	no reaction
C	reaction	reaction
D	reaction	no reaction

- 28 Which statement about the elements in the Periodic Table is correct?

A Group 0 elements are unreactive metals.
B Group I elements form covalent chlorides.
C Group VII elements form ions when combined with other elements.
D The elements become more metallic from right to left across a period.

29 The results of adding some metals to salt solutions are shown below

metal	salt solution of metal		
	X	Y	Z
X	-	Y displaced	Z displaced
Y	no reaction	-	no reaction
Z	no reaction	Y displaced	-

What is the order of reactivity of the metals?

	most reactive	→	least reactive
A	X	Z	Y
B	Y	X	Z
C	Z	X	Y
D	Z	Y	X

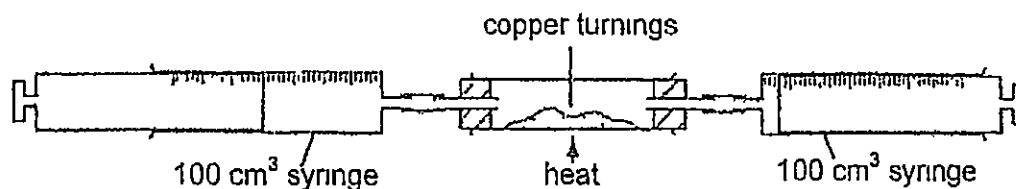
30 What are the conditions needed for rusting?

- 1 heat
- 2 iron
- 3 magnesium
- 4 oxygen
- 5 salt
- 6 water

- A 1, 2, 4, 5, 6
C 3, 4, 6

- B 2, 3, 4, 6
D 2, 4, 6

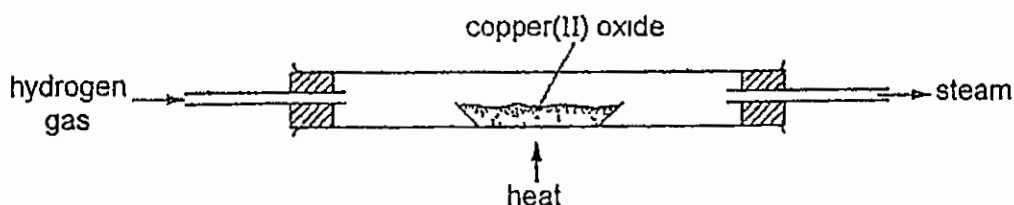
31 A 80 cm³ sample of air was placed in a gas syringe in the setup below



The air was passed backward and forward over heated copper turnings. What will be the volume of air at the end of the experiment when the setup is cooled to room temperature?

- A 16.8 cm³ B 21.0 cm³ C 63.2 cm³ D 79.0 cm³

- 32 Hydrogen gas is passed over heated copper(II) oxide in the setup below



Which of the following is correct?

- | | <u>oxidising agent</u> | <u>reducing agent</u> |
|---|------------------------|-----------------------|
| A | hydrogen gas | copper(II) oxide |
| B | copper(II) oxide | hydrogen gas |
| C | hydrogen gas | steam |
| D | copper(II) oxide | steam |

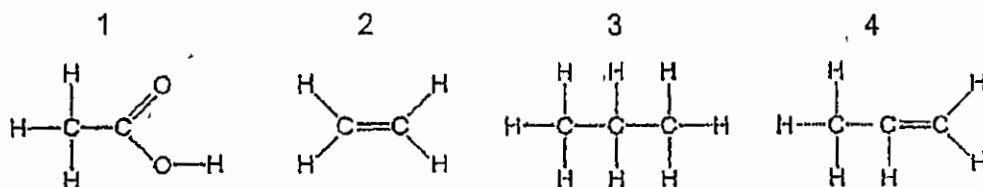
- 33 Sulfur dioxide is a pollutant emitted from car exhausts. Which of its properties makes it harmful to humans?

- A It is pungent.
B It has a corrosive action on lung tissue.
C It forms a stable compound with blood.
D It combines with oxygen in the lungs.

- 34 Useful fractions are obtained by the fractional distillation of petroleum. Which fraction and use are correct?

	fraction	use
A	bitumen	for making road surfaces
B	lubricating oils	fuel in cars
C	paraffin	for making waxes and polishes
D	petrol	fuel for aircraft

- 35 The structures of 4 organic compounds are shown. Which compounds decolourise aqueous bromine?



- A 1 and 2 B 1 and 4 C 2 and 3 D 2 and 4

36 Decane is an alkane. It has 10 carbon atoms per molecule. What is the molecular formula of decane?

- A $C_{10}H_{12}$ B $C_{10}H_{20}$ C $C_{10}H_{22}$ D $C_{10}H_{24}$

37 Which statement about a homologous series is **not** correct?

All the members of the series have the same

- A chemical properties B general formula
C functional group D physical properties

38 Which of the following shows the correct monomer for making the polymer?

	monomer	polymer
A	$\begin{array}{c} \text{H} \quad \text{H} \\ \quad \\ \text{H}-\text{C}-\text{C}-\text{H} \\ \quad \\ \text{H} \quad \text{H} \end{array}$	$\begin{array}{c} \text{H} \quad \text{H} \quad \text{H} \quad \text{H} \\ \quad \quad \quad \\ -\text{C}-\text{C}-\text{C}-\text{C}- \\ \quad \quad \quad \\ \text{H} \quad \text{H} \quad \text{H} \quad \text{H} \end{array}$
B	$\begin{array}{c} \text{H} \quad \text{H} \\ \quad \\ \text{H}-\text{C}-\text{C}-\text{O}-\text{H} \\ \quad \\ \text{H} \quad \text{H} \end{array}$	$\begin{array}{c} \text{H} \quad \text{H} \quad \text{H} \quad \text{H} \\ \quad \quad \quad \\ -\text{C}-\text{C}-\text{O}-\text{C}-\text{C}-\text{O}- \\ \quad \quad \quad \\ \text{H} \quad \text{H} \quad \text{H} \quad \text{H} \end{array}$
C	$\begin{array}{c} \text{H} \quad \text{H} \\ \quad \\ \text{C}=\text{C} \\ \quad \\ \text{Cl} \quad \text{H} \end{array}$	$\begin{array}{c} \text{H} \quad \text{H} \quad \text{H} \quad \text{H} \\ \quad \quad \quad \\ -\text{C}-\text{C}-\text{C}-\text{C}- \\ \quad \quad \quad \\ \text{Cl} \quad \text{H} \quad \text{Cl} \quad \text{H} \end{array}$
D	$\begin{array}{c} \text{H} \quad \text{H} \\ \quad \\ \text{C}=\text{C} \\ \quad \\ \text{CH}_3 \quad \text{H} \end{array}$	$\begin{array}{c} \text{CH}_3 \quad \text{CH}_3 \quad \text{CH}_3 \quad \text{CH}_3 \\ \quad \quad \quad \\ -\text{C}-\text{C}-\text{C}-\text{C}- \\ \quad \quad \quad \\ \text{H} \quad \text{H} \quad \text{H} \quad \text{H} \end{array}$

39 Wine can deteriorate after a period of time because of atmospheric oxidation. Which compound would be formed by the oxidation of the alcohol in the wine?

- A CH_3COOH B $\text{C}_2\text{H}_5\text{OH}$
C CH_3COCH_3 D $\text{C}_2\text{H}_5\text{COOH}$

- 40 Ethanol can be oxidised by hot acidified aqueous potassium manganate(VII)
Which colour change is observed?
- A colourless to purple
 - B green to orange
 - C orange to green
 - D purple to colourless

DATA SHEET

Colours of Some Common Metal Hydroxides

calcium hydroxide	white
copper(II) hydroxide	light blue
iron(II) hydroxide	green
iron(III) hydroxide	red-brown
lead(II) hydroxide	white
zinc hydroxide	white

DATA SHEET The Periodic Table of the Elements

Group																						
I	II											III	IV	V	VI	VII	0					
											1 H Hydrogen 1											2 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 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	96 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 Cesium 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	210 Po Polonium 84	210 At Astatine 85	210 Rn Radon 86					
87 Fr Francium 87	226 Ra Radium 88	227 Ac Actinium 89																				
*58-71 Lanthanoid series +90-103 Actinoid series																						
Key		a X b	a = relative atom mass X = atomic symbol b = proton (atomic) number																			
140 Ce Cerium 58	141 Pr Praseodymium 59	144 Nd Neodymium 60	150 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	232 Pa Protactinium 91	238 U Uranium 92	238 Np Neptunium 93	244 Pu Plutonium 94	244 Am Americium 95	247 Cm Curium 96	247 Bk Berkelium 97	251 Cf Californium 98	252 Es Einsteinium 99	257 Fm Fermium 100	259 Md Mendelevium 101	261 No Nobelium 102	261 Lr Lawrencium 103									

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

Name ()	Class.
 GREENDALE SECONDARY SCHOOL Preliminary Examination 2015	
SCIENCE	5076/02
Paper 2 Physics	31 July 2015
Secondary 4 Express / 5 Normal	1 hour 15 minutes

READ THESE INSTRUCTIONS FIRST

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

Write your name, class and register number in the spaces at the top of this page

Write in dark blue or black pen

You may use a soft pencil for any diagrams, graphs, tables or rough working

Do not use staples, paper clips, highlighters, glue or correction fluid

Section A Answer all questions

Write your answers in the spaces provided on the question paper

Section B Answer any two questions.

Write your answers in the spaces provided on the question paper

At the end of the examination, fasten all your work securely together

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

For Examiner's Use	
Paper 1	/ 20
Paper 2 Section A	/ 45
Paper 2 Section B	/ 20
Total	/ 85

Parent's Signature

This document consists of 14 printed pages.

[Turn over

Section A

Answer all the questions in this section

Write your answers in the spaces provided on the question paper

- 1 Fig 1.1 shows a ball suspended on two elastic ropes that are attached to two steel poles. The tension in each elastic rope is 700 N when the angle between each rope and the imaginary vertical line is 50° . The weight of the ball is balanced by the tension in the two elastic ropes.

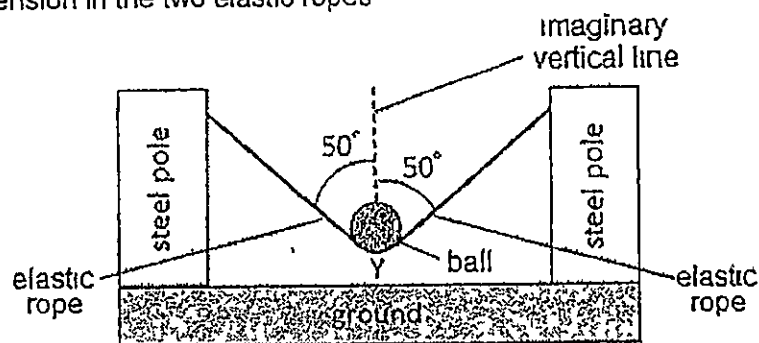


Fig 1.1

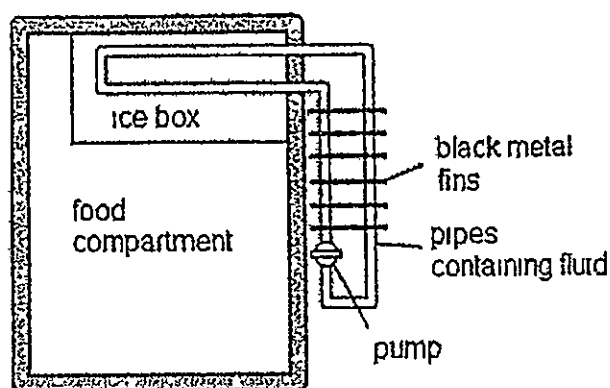
- (a) By drawing a scale diagram in the space below, determine the total force exerted by the elastic ropes on the ball

total force, with direction = N [4]

- (b) Calculate the mass of the ball.

mass = kg [2]

- 2 The figure below shows a refrigerator.
A fluid pumped through the pipes takes thermal energy (heat) out of the ice box
This energy passes into the air at the back of the refrigerator through the black metal fins



- (a) Explain how the ice box at the top of the refrigerator keeps the whole of the food compartment cool

.....

.....

.....

..... [3]

- (b) Briefly explain why the ice box is not positioned at the bottom of the refrigerator

.....

..... [1]

- (c) Explain why the fins are painted black.

.....

..... [1]

- 3 Communication is vital for society. In science, mankind has progressed from verbal communication by sound, a longitudinal wave, to primitive signals and electronic communications. However, the most basic and essential mode of communication is still verbal.

(a) State what is meant by *longitudinal wave*.

... [1]

- (b) Besides verbal communication, sound can also be used to estimate distances. During level camp in Gopeng, Perak, John stood in front of a cave and shouted "Hello!" The sound returned to him in 2.4 s. The speed of sound was 340 m/s.

(i) Calculate the distance of the cave.

distance = ... [2]

- (ii) In order to produce a louder sound, John used more energy to project his voice. Draw on Fig. 3.1 the wave representing a louder sound with the same pitch. [1]

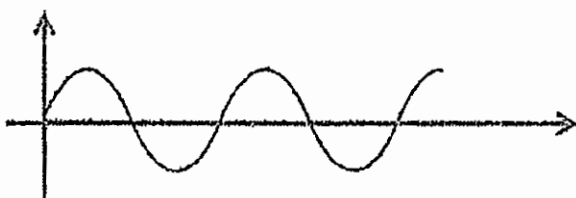


Fig. 3.1

- 4 Fig 4.1 shows the position of an object and a thin converging lens with its focal points, F

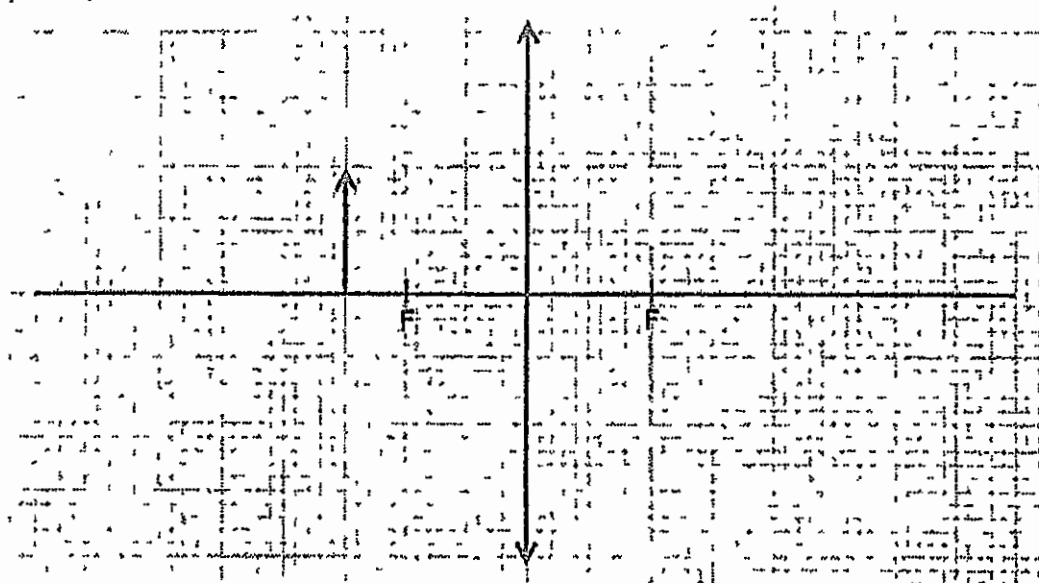


Fig 4.1

- (a) On Fig. 4.1, draw two rays and the image of the object [2]
- (b) State two characteristics of the image
 [1]
- (c) State an application for this arrangement of object and lens
 [1]
- (d) Calculate the refractive index of the glass used to make the lens, given that the speed of light in the glass lens is 2.5×10^8 m/s.

refractive index = [2]

- (e) Why light travels at a slower speed in the glass lens compared to air?
 [1]

- 5 Fig 5.1 shows the graph of temperature against time when the oil is heated

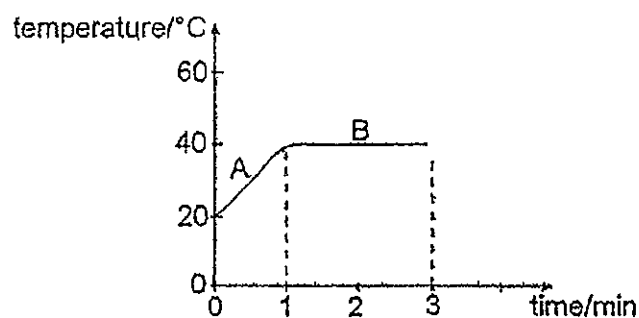


Fig 5.1

- (a) What are the states of the oil at A and B respectively? [2]

A

B

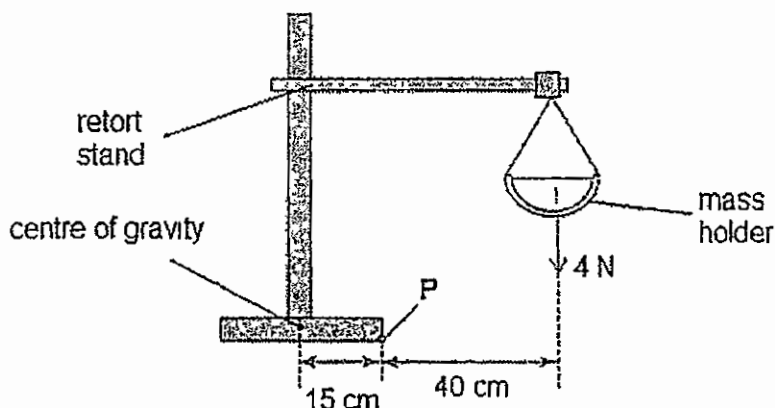
- (b) Why temperature stays constant at B?

. [1]

- (c) In terms of kinetic particles theory, describe the changes to the movement and arrangement of the oil molecules when the oil boils

. [2]

- 6 During a Physics laboratory lesson, students are expected to use the principle of moments to estimate the mass of a retort stand. A student James sets up the apparatus as shown in the figure below



- (a) James adds mass to the mass holder. He notices that the retort stand is about to overturn when the weight of the mass added is 4 N

- (i) Calculate the moment of the 4 N weight about the pivot P

moment = . . . [2]

- (ii) By using the principle of moments and your answer in (a)(i), calculate the weight of the retort stand

weight = . . . [2]

- (b) Base on the answers to part (a), state one assumption that you had made

. [1]

7 Fig 7.1 below shows an electric circuit

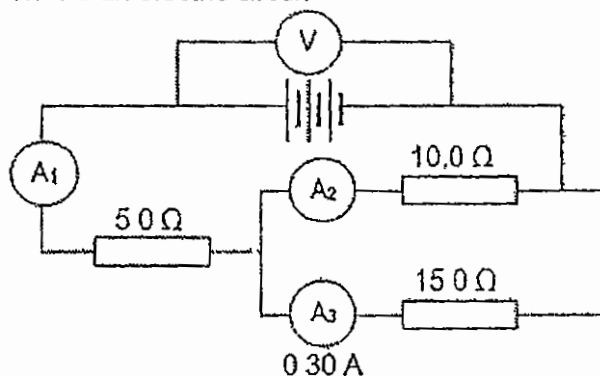


Fig. 7.1

Using the values shown, calculate

(a) the potential difference across the $15.0\ \Omega$ resistor

potential difference = [2]

(b) the current through ammeter A_2 ,

current = [2]

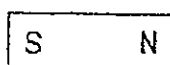
(c) the reading of the voltmeter across the cells,

voltage = [3]

(d) what is the amount of charges that flows through ammeter A_1 every minute?

amount of charges = [2]

- 8 (a) Draw the magnetic field lines of the bar magnet below [2]



- (b) Two unlabeled metal bars, an iron and a magnet were mixed up. Describe a test to determine which one is the magnet

.....
.....
..... [2]

Section B

Answer **any two** questions

Write your answers in the spaces provided on the question paper

- 9 A saloon car of 1200 kg in Singapore is accelerated uniformly from rest to a speed of 20 m/s in 10 s

(a) Calculate the acceleration of the car

acceleration = . . . [2]

(b) Calculate the resultant force acting on the car

resultant force = . . . [2]

(c) Given that the frictional force between the road and the tyres is 400 N, calculate the driving force by the engine

driving force = . . . [2]

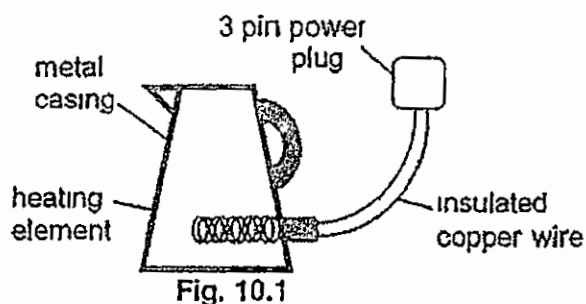
(d) Calculate the kinetic energy of the car at $t = 10$ s

kinetic energy = . . . [2]

(e) Will work done by the engine of the car be equal to the kinetic energy gained by the car? If not, will it be higher or lower? Explain your answer clearly

.
.
. [2]

- 10 Fig 10.1 shows an electric kettle with its power plug connected. The details of the electric kettle are shown in Fig 10.2



- (a) The electric kettle was fitted with a fuse 3.5 A. With reference to Fig. 10.2, is the fuse fitted suitable? Explain your answer with suitable calculations [2]

- (b) Explain how a person is protected from electric shock by the Earth wire when the electric kettle is switched on and encounters some electrical faults

.....

.....

.....

[2]

- (c) Explain how the fuse in the electrical kettle could prevent electrical fire hazard

.....

.....

.....

[2]

- 10 (d) Fig 10.3 shows an electromagnetic relay switch to operate a lamp.

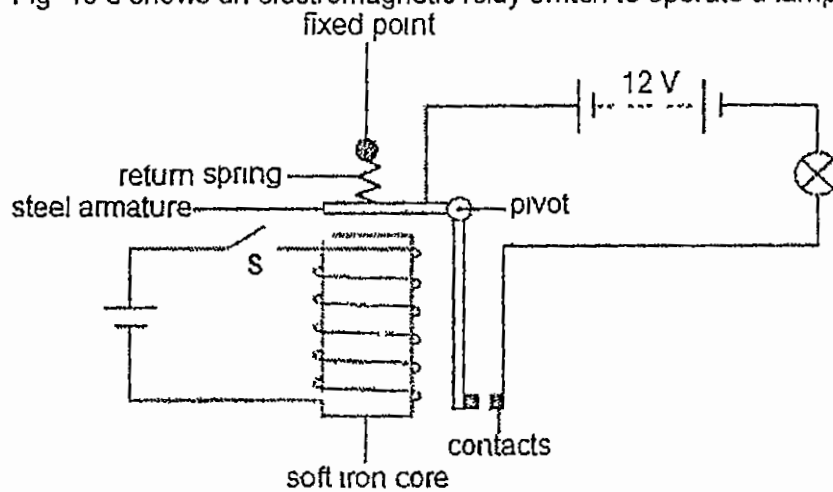


Fig. 10.3

- (i) Explain why the contacts close when switch S is closed

.....

 [2]

- (ii) Explain why soft iron, not steel, is used for the core

.....

 [2]

- 11 Classical mechanics, or Newtonian Physics, has two main types of forces, contact force and non-contact forces. Contact force is exerted when the force is acted through physical contact, whereas non-contact force can be applied at a distance. Examples of contact forces include push, pull and compression. Examples of non-contact forces include electric force, magnetic force and gravitational force. Gravitational forces due to Earth are commonly referred to as weight.

- (a) Complete the table below indicating the corresponding particles that will experience the non-contact forces in different fields. [3]

Type of non-contact forces	Region in which the force is experienced	Particles/objects that experience the force
Gravitational force		
	Electric field	
		Magnets / magnetic material

- (b) An oil drop of 0.5 g is suspended in the air inside an uniform electric field due to two parallel plates. The whole experiment is carried out in a closed laboratory in Singapore.

- (i) Draw the electric field between the parallel plates in Fig 11.1 [1]

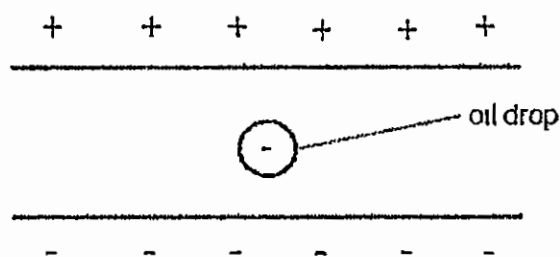


Fig. 11.1

- (ii) State the forces experienced by the oil drop in Fig 11.1 above.

..... [2]

- 11 (c) Given that the electric force experienced by the 0.5 g oil drop has a magnitude of $5 \times 10^3 \mu\text{N}$,

(i) Convert $5 \times 10^3 \mu\text{N}$ into N, with appropriate working

electric force = N [2]

- (ii) Is electronic balance a suitable equipment to measure a force of this magnitude? Explain your answer

.....
.....
..... [2]

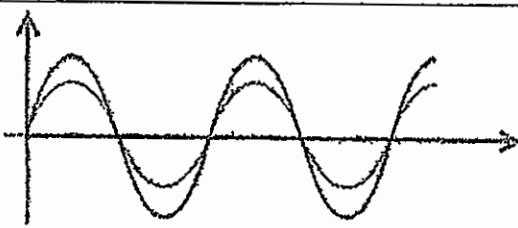
The End

Greendale Secondary School
 Sec 4E5N Sc(Physics)
 Preliminary Exam 2015
 Suggested solutions

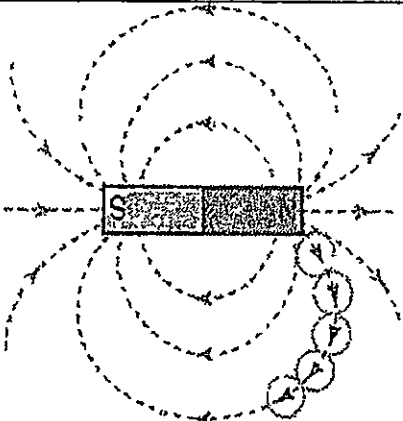
Paper 1

1	2	3	4	5	6	7	8	9	10
B	B	C	D	B	B	A	C	C	A
11	12	13	14	15	16	17	18	19	20
D	A	B	C	A	B	B	C	D	D

Paper 2 Section A:

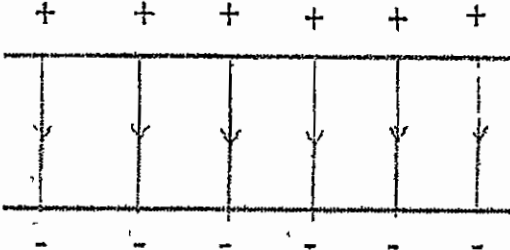
1 (a)	Scale = 1 cm : 100 N (do not accept more than 100 N)
	Award 1 mark only if all the following are done. 1) Forces are drawn in solid lines, with an arrow and labelled 2) F_R is drawn in solid line with a double arrow and labelled 3) the constructions lines are dotted
	Magnitude = $9.0 \times 100 = 900 \text{ N}$, acceptable range. (855 N – 945 N)
	Direction = 50° to 700 N , acceptable range. ($45^\circ - 55^\circ$)
(b)	$W = mg$ $900 = m \times 10$
	$m = 90 \text{ kg}$, acceptable range (85.5 – 94.5 kg), consistent with the magnitude in (a)
2 (a)	The ice at the top cools the air around it. Cooler air, being denser, sinks to the bottom, Warmer air at the bottom, being less denser, rises to the top Convection current is set up to cool the whole compartment
(b)	It will take a longer time to cool the compartment as convection current will not be formed.
(c)	Black surface is a good emitter of radiation energy/ heat / radiant heat
3 (a)	Particle vibration is parallel to the direction of wave motion
(b)(i)	$d = s \times t$ $= 340 \times (2.4 \div 2)$ $= 408 \text{ m}$
(b)(ii)	Longer, sound travels twice the distance of the cave.
3 (b)(iii)	 -same frequency -wave showing a higher amplitude

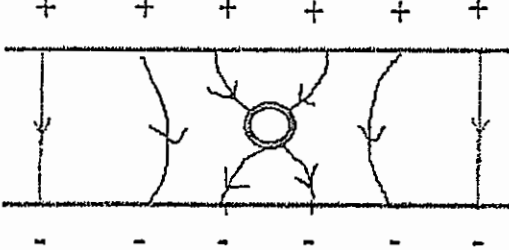
4(a)	
	Arrows must be present in both rays
(b)	Real, inverted, magnified (any two)
(c)	Projector or any other device that produce larger real image
(d)	$n = c/v$ $= (3 \times 10^8)/(2.5 \times 10^8)$ $= 1.2$
5 (a)	A, liquid state
	B mixture of liquid and gaseous states
(b)	Energy absorbed is used to break/overcome/weaken the intermolecular bonds/overcome strong forces of attraction between particles.
(c)	Movement of oil molecules changes from slide past each other to random motion at high speed
	Arrangement of oil molecules changes from closely packed to far apart
6 (a)(i)	$\text{Moment} = F \times d$ $= 4 \times 40$ $= 160 \text{ Nm} \text{ accept } 160 \text{ Nm}$
(a)(ii)	Taking moment about point P, Clockwise moment = anticlockwise moment = $F \times d$ $160 = 15 \times W$ $W = 10.7 \text{ N}$
(b)	The retort stand is at equilibrium
7(a)	$V_3 = IR$ $= 0.30 \times 15.0$ $= 4.5 \text{ V}$
(b)	$V_2 = IR$ $4.5 = I \times 10$

	$I = 0.45 \text{ A}$
(C)	$I_{\text{total}} = I_1 + I_2$ $= 0.45 + 0.30$ $= 0.75 \text{ A}$
	$V_1 = IR$ or $R_e = R_1 + (1/R_2 + 1/R_3)^{-1}$ $= 0.75 \times 5.0$ $= 5 + (1/10 + 1/15)^{-1}$ $= 3.75 \text{ V}$ $= 11 \Omega$
	$V = V_1 + V_2$ or $V = IR$ $= 3.75 + 4.5$ $= 0.75 \times 11$ $= 8.25 \text{ V}$ $= 8.25 \text{ V}$
(d)	$Q = It$ $= 0.75 \times 60$ $= 45 \text{ C}$
8 (a)	 Direction of arrow –1 mark Pattern –1 mark [compass is not required]
(b)	Place another magnet near the four ends of both metal bars with the same pole.
	The bar with one end repelling the magnet is magnet

Paper 2 Section B:

9 (a)	$a = \frac{\Delta v}{\Delta t}$ $= \frac{20 - 0}{10}$ Accept $a = \frac{v - u}{t}$ but remind students that $t = \text{time taken}$
	$= 2 \text{ m/s}^2$
(b)	$F_R = ma$ $= 1200 \times 2$ $= 2400 \text{ N}$
(c)	$F_R = F - 400$ $2400 = F - 400$ $F = 2800 \text{ N}$

(d)	$E_k = \frac{1}{2} mv^2$ $= \frac{1}{2} (1200) (20)^2$ $= 240\,000\text{ J or }240\text{ kJ}$
(e)	No, it will be higher Some energy is lost due to friction as heat and sound energy
10	$P = IV$
(a)	$1000 = I \times 240$ $I = 4.17\text{ A}$
	The 3.5 A fuse is not suitable as the fuse rating of 3.5 A is less than the circuit current of 4.17 A
10(b)	It provides a low resistance path for the short circuit current to flow to earth to prevent electrocution to user.
(c)	The fuse will blow when the current through it in the kettle exceed its fuse rating, hence protecting the equipment from overheating and prevent electrical fire hazard
(d)(i)	When S is closed, soft iron core becomes a temporary magnet Steel armature is attracted to the soft iron core and rotate anti-clockwise, causing the contacts to be closed
(ii)	Soft iron loses its magnetism easily, so that contacts will be open by return spring when there is no current passing through the solenoid Steel retains its magnetism permanently, the electromagnetic relay would not be working as steel armature will still be attracted to the solenoid when switch S is open
11(a)	Gravitational field, mass
	Electric force, charge
	Magnetic force, magnetic field
(b)(i)	 Equal spacing, with arrow Accept result electric field, taking negative charge of the oil into account

	
(ii)	Electric force,
	weight/gravitational force (do not accept gravity)
(c)(i)	$5 \times 10^3 \times 10^{-6}$
	$= 5 \times 10^{-3} \text{ N}$
(c)(ii)	No, electric balance is used to measure mass.
	To measure force, spring balance is required

