Name:	Class	Index Number

Jurong West Secondary School

Preliminary Examinations 2016

SCIENCE **5076/01**

Secondary Four Express / Five Normal (Academic) **22 August 2016**

Paper 1 Science (Physics/Chemistry) **0800 – 0900**

1 hour

Additional Materials: Multiple Choice Answer Sheet

READ THESE INSTRUCTIONS FIRST

Write in soft pencil.
Do not use staples, paper clips, glue or correction fluid.
Write your name, class and index number on the Answer Sheet and Question Paper in the spaces provided unless this has been done for you.

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.

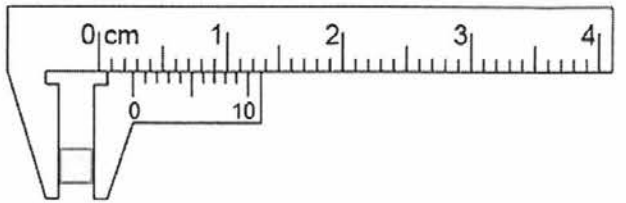
Each correct answer will score one mark. A mark will not be deducted for a wrong answer.
Any rough working should be done in this booklet.
The use of an approved scientific calculator is expected, where appropriate.

A copy of the Data Sheet is printed on page 16.
A copy of the Periodic Table is printed on page 17.

After checking of answer script		
Checked by	**Signature**	**Date**
Student		

This document consists of **17** printed pages including this cover page

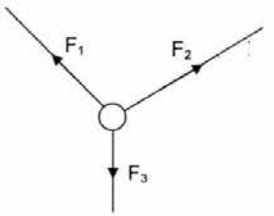
1 The diagram below shows a pair of vernier calipers used to measure the width of a cube.



What is the width of the cube?

A 0.07 cm **B** 0.09 cm **C** 0.27 cm **D** 0.29 cm

2 An object O is placed at rest on the surface of a level table. Three horizontal forces F_1, F_2 and F_3 act simultaneously on the object O, which is in equilibrium.



Which statement about object O is incorrect?

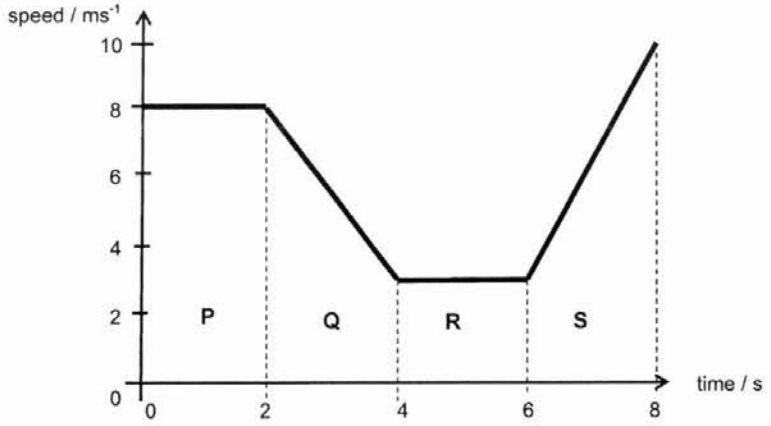
A If object O is heavier, the values of F_1, F_2 and F_3 will change.
B F_1, F_2 and F_3 lie on the same plane.
C Removing F_1 and F_2 will cause object O to move in the direction of F_3.
D The resultant force that acts on object O is zero.

3 The table below shows the respective weights and masses of different objects on the surface of four different planets.

Which planet has the largest gravitational field strength?

	mass / kg	weight / N
A	25	50
B	30	60
C	25	55
D	30	65

4 The diagram shows the speed-time graph of a moving car.



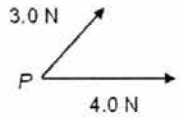
Which segment of the graph does the car have the greatest average speed?

A P
B Q
C R
D S

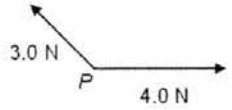
5 A 3.0 N force and a 4.0 N force act concurrently on an object at point *P*.

Which one of the following diagrams will produce the greatest resultant force acting on point *P*?

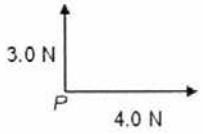
A



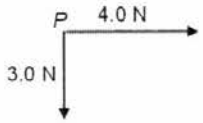
B



C

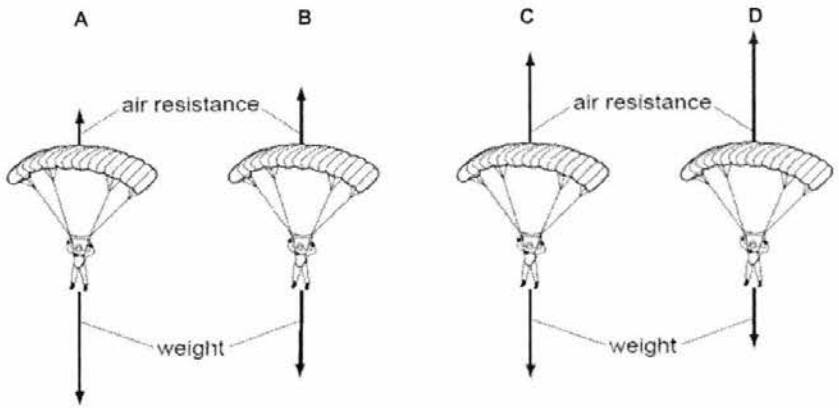


D

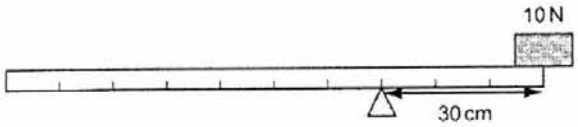


6 The diagrams show the forces acting on four parachutists. The size of each force is shown by the length of the arrows.

Which diagram shows a parachutist moving with constant speed?



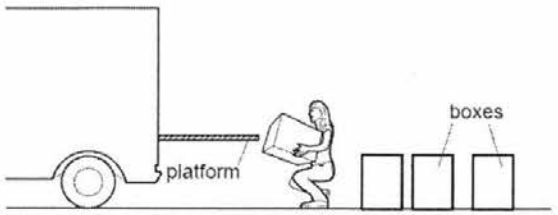
7 A uniform bar of length 1.0 m is supported 30 cm from one end. In order to balance the bar, a weight of 10 N is glued on the end.



What is the weight of the bar?

A 4.3 N
B 6 N
C 15 N
D 20 N

8 A person lifts boxes of equal weight onto a platform.



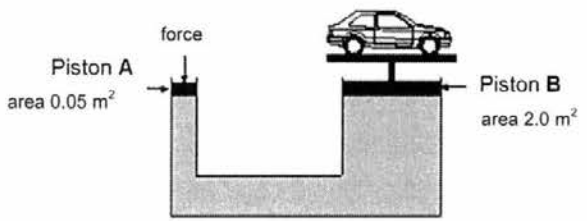
Which quantity will not affect the work done by the person?

A the height of the platform above the ground
B the number of boxes lifted
C the time taken to lift the boxes
D the weight of the boxes

9 After a 2.4 km run during the school's fitness test, a student sits under the ceiling fan in the classroom. The perspiration on his skin evaporated quickly. Which of the following describes the change in temperature of his body and the amount of kinetic energy possessed by the liquid molecules leaving the surface of his skin?

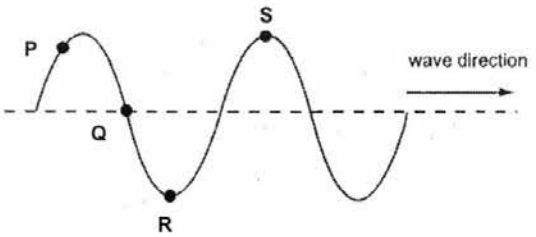
	Temperature	Amount of kinetic energy possessed by liquid molecules at the surface of the skin
A	Decrease	High
B	Increase	High
C	Decrease	Low
D	Increase	Low

10 A car weighing 1.0×10^5 N is lifted by a hydraulic jack. The area of the piston **B** under the car is 2.0 m^2. If the area of piston **A** is 0.05 m^2, what is the mininum force which has to be applied to piston **A** in order to lift up the car?



A 2.5×10^3 N
B 5.0×10^3 N
C 1.0×10^4 N
D 2.0×10^4 N

11 The diagram below shows an instantaneous position of a water wave travelling in the direction shown.

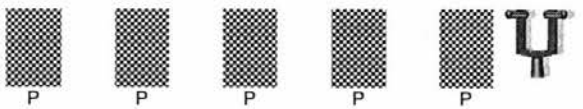


Which of the following statement is/are correct?

1 The particle Q is momentarily at rest.
2 The particles P and Q are moving in the same direction.
3 The particles R and S are vibrating at the highest speed.
4 All the particles in the string vibrate with same frequency.

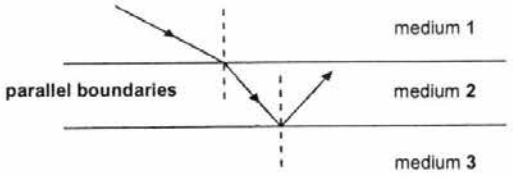
A 1 only
B 4 only
C 1 and 3 only
D 1, 2 and 3 only

12 A pure sound of frequency 90 Hz propagates in air and results in a series of compression and rarefaction. The shaded areas P in the figure below represent regions where air molecules are the most crowded together. If the distance between the first and the fifth shaded areas is 12.0 m, what is the speed of the sound?



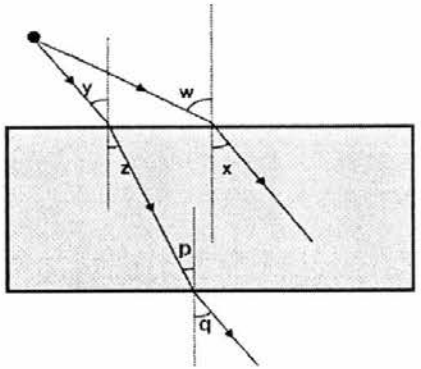
A 216 m/s
B 270 m/s
C 330 m/s
D 1080 m/s

13 A ray of light travels from medium **1** to medium **2** and undergoes total internal reflection as shown in the diagram below. Which of the following statements is correct?



A Medium **2** has higher optical density than medium **1** and medium **3**.
B The ray will be refracted towards the normal when it emerges from medium **2** to medium **1**.
C The ray will again undergo total internal reflection at the boundary between medium **2** and medium **1**.
D If the angle of incidence in medium 2 is larger, then the ray will be able to pass into medium **3**.

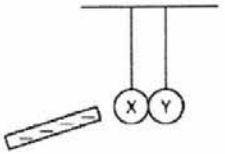
14 The figure below shows two rays of light entering a glass block.



Which equation is correct?

A $\frac{w}{x} = \frac{y}{z}$
B $\frac{\sin w}{\sin x} = \frac{\sin q}{\sin p}$
C $\frac{\sin y}{\sin z} = \frac{\sin p}{\sin q}$
D $\frac{\sin w}{\sin x} = \frac{\sin z}{\sin y}$

15 The diagram below shows two metal spheres X and Y in contact that are suspended by insulating threads.
A negatively charged plastic rod is held near to sphere X. What is the net charge on X and Y respectively?

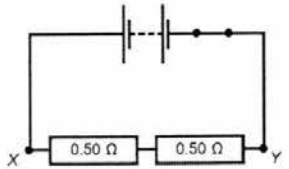


	sphere X	sphere Y
A	positive	negative
B	positive	neutral
C	positive	positive
D	neutral	neutral

16 The resistance of a wire is R. Its length and cross-sectional area are L and A respectively. When its length is increased to $4L$ and its cross-sectional area to $2A$, its resistance becomes _____.

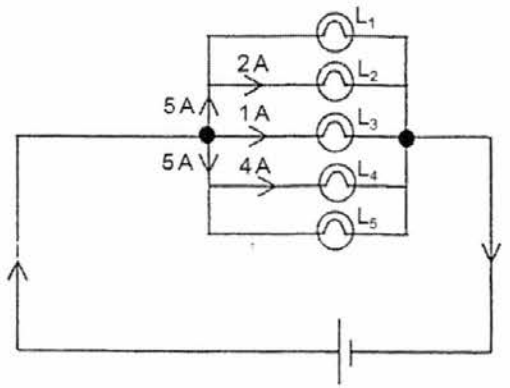
A $0.5R$ B R C $2R$ D $8R$

17 The diagram shows two 0.50 Ω resistors connected in series.
The current at point X is 3.0 A.
How much charge is passing through point Y in 2.0 s?



A 0 C B 1.5 C C 3.0 C D 6.0 C

18 Which lamp(s) in the circuit below has/have the lowest resistance?

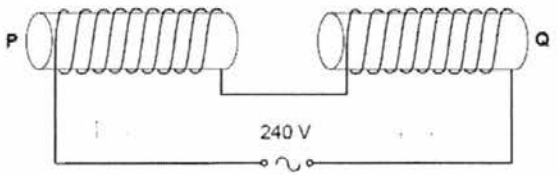


A L_1 B L_2 C L_3 and L_5 D L_4

19 An electric kettle is plugged in and switched on. The fuse in the plug blows immediately. Which single fault could cause this?

A The earth wire is not connected to the kettle.
B The live wire and neutral wire connections in the plug were swapped around.
C The live wire touches the metal case of the kettle.
D The wires connected to the plug are too thin.

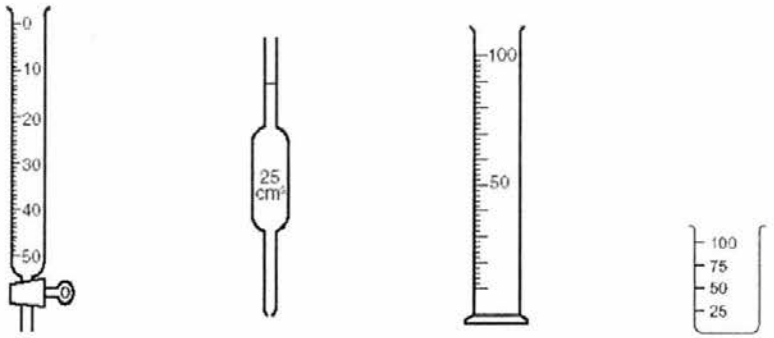
20 Two iron bars P and Q are placed inside two solenoids as shown below.



When the solenoids are connected to an a.c. power supply, P and Q will

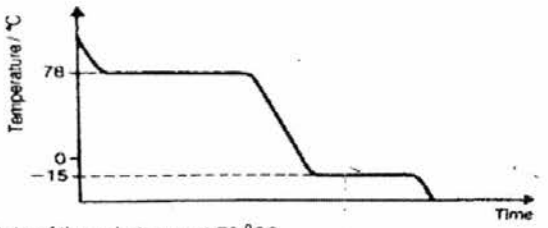
A repel each other.
B attract each other.
C oscillate towards and away from each other.
D oscillate upwards and downwards.

21 Which piece of apparatus would be most suitable to measure accurately the volume of acid needed to neutralise 25.0 cm^3 of an alkali?



A B C D

22 The cooling curve below shows how the temperature of a gaseous substance changes with time as it is cooled.



What is the state of the substance at 78 °C?

A Solid
B Solid-liquid mixture
C Liquid
D Gas-liquid mixture

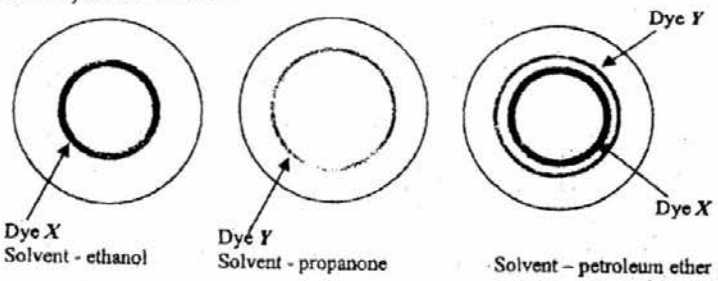
23 The atoms of element X have the electronic configuration 2,8,6.
Which statement about element X is correct?

A It forms an ionic compound with sodium.
B It forms an ion of charge 2+.
C It has 6 protons in the outer shell of an atom.
D It only reacts with non-metals.

24 An aqueous solution contains either lead(II) sulfate or zinc sulfate.
Which aqueous reagent can be used to confirm the identity of the salt present?

A Ammonia
B Barium nitrate
C Silver nitrate
D Sodium hydroxide

25 Forensic scientists investigating some paint fragments found near the site of a fatal car accident suspect that it contains two coloured dyes **X** and **Y**. On crushing the paint and making a chromatogram using ethanol as the solvent, they found a single ring of dye **X**. When they repeated the process with propanone as the solvent, they again get a single ring- this time of dye **Y**. However, with petroleum ether as the solvent, two rings for the two dyes are obtained.



Which of the following statements is correct?

A **Y** is soluble in ethanol but **X** is not.
B **X** is soluble in ethanol and petroleum ether.
C **Y** is soluble in propanone but insoluble in petroleum ether.
D **X** is soluble in ethanol and propanone.

26 An atom of element **X** is represented by $^{9}_{4}\mathbf{X}$.
Which statement about an atom of **X** is true?

A The total number of protons and electrons is 8.
B The total number of protons and neutrons is 13.
C It is in Group IV of the Periodic Table.
D It occurs as a diatomic molecule.

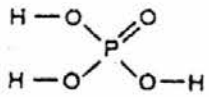
27 Consider the following particles:

Particles	Number of protons	Number of electrons	Number of neutrons
P	26	23	30
Q	12	12	12
R	26	24	30
S	13	10	14
T	25	23	30
U	12	10	14

Which two particles are isotopes?

A **P** and **R**
B **R** and **T**
C **S** and **U**
D **Q** and **U**

28 The bonding in phosphoric acid can be represented by the structural formula below.



What is the total number of electrons in the covalent bonds surrounding the phosphorus atom?

A 4
B 5
C 8
D 10

29 What is the volume of sulfur dioxide produced at r.t.p when 9.7 g of zinc sulfide reacts with excess oxygen?

$$2\ ZnS + 3\ O_2 \rightarrow 2ZnO + 2\ SO_2$$

A 1.2 dm^3
B 2.4 dm^3
C 3.6 dm^3
D 4.8 dm^3

30 Which of the following statements correctly describes an exothermic reaction?

A Energy is taken in to form bonds.
B Energy is given out to break bonds.
C The temperature of the surrounding decreases.
D The temperature of the surrounding increases.

31 Marble chips react with dilute hydrochloric acid according to the following equation:

$$CaCO_3(s) + 2HCl(aq) \rightarrow CaCl_2(aq) + H_2O(l) + CO_2(g)$$

Which one of the following statements correctly explains why powdered marble chips speed up the reaction?

A Powdered marble chips act as a catalyst.
B Powdered marble chips break chemical bonds.
C Powdered marble chips release reactive substances.
D Powdered marble chips produce a large surface area.

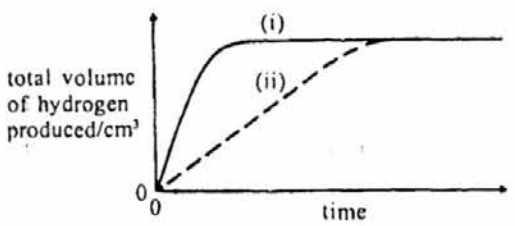
32 A solid **X** is insoluble in water but dissolves in both an acid and an alkali without production of a gas in either case. Which one of the following could be solid **X**?

A Copper(II) carbonate
B Copper(II) oxide
C Zinc carbonate
D Zinc oxide

33 Which pair of the underlined element has the same oxidation state in both compounds?

A $\underline{Cu}Cl_2$ and $Na\underline{Cl}$
B $H_2\underline{S}$ and $\underline{S}O_2$
C $\underline{Fe}_2O_3$ and $\underline{Fe}SO_4$
D $\underline{Mn}O_2$ and $\underline{Mn}Cl_2$

34 In the graph below, curve (i) was obtained when 1 g of granulated zinc reacted with an excess of hydrochloric acid at 30 °C. Which of the following changes to this reaction would give curve (ii)?



A Using 0.5 g of granulated zinc
B Using 1 g of finely powdered zinc
C Warming the acid to 40 °C
D Adding water to dilute the acid

35 Which of the following statements about the Periodic Table is false?

A The elements are arranged according to increasing proton number.
B The metallic property decreases when moving from left to right of the Periodic Table.
C The elements are arranged according to increasing relative atomic mass.
D The elements in the same group have the same number of valence electrons.

36 The methods to extract three metals are as shown in the table below.

Metal	Method of extraction
X	Electrolyse molten metal oxide
Y	Heat metal oxide with carbon
Z	Occurs naturally as the metal

What is the order of reactivity of the metals?

	Most reactive →		Least reactive
A	X	Y	Z
B	X	Z	Y
C	Y	Z	X
D	Z	X	Y

37 Solution **X** is able to change the colour of acidified potassium manganate(VII) from purple to colourless.
What does solution **X** contain?

A An alkali
B An ammonium salt
C An oxidizing agent
D A reducing agent

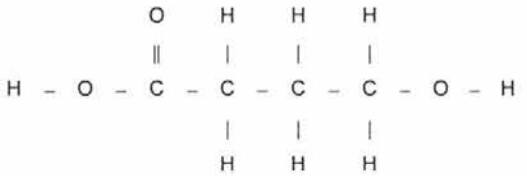
38 Industrially ethanol can be produced by the reaction of steam with ethene.

$$C_2H_4(g) + H_2O(l) \rightarrow C_2H_5OH(l)$$

Which of these statements about the process is **not** true?

A Ethene is an unsaturated molecule.
B Ethanol is a saturated molecule.
C The reaction is an addition reaction.
D The reaction is a condensation reaction.

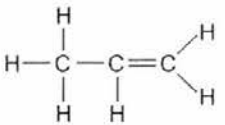
39 The diagram shows a compound **M**.



Which of the following properties is true for compound **M**?

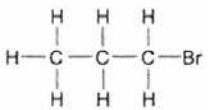
A It can undergo addition polymerisation.
B It can react with carbonate to produce carbon dioxide.
C It can produce two moles of hydrogen ions when one mole of **M** dissolves in water.
D It can turn Universal Indicator blue.

40 Propene is an unsaturated hydrocarbon. Its structure is shown below.

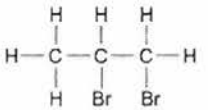


What is produced when propene reacts with bromine?

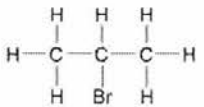
A



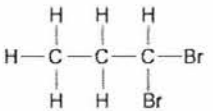
B



C



D



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

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

*58-71 Lanthanoid series

†90-103 Actinoid series

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

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

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

Jurong West Secondary School
Preliminary Examination 2016
Mark Scheme

Secondary Four Express / Five Normal (Academic)

SCIENCE (PHYSICS/CHEMISTRY) 5076

PAPER 1

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

Name:	Class	Index Number

Jurong West Secondary School

Preliminary Examinations 2016

SCIENCE

5076/02

Secondary Four Express / Five Normal (Academic)

Paper 2 Physics

30 August 2016

0800 – 0915

1 hour 15 minutes

Candidates answer on the Question Paper.

No Additional Materials are required.

READ THESE INSTRUCTIONS FIRST

Write your name, class and index number on the work you hand in.
Write in dark blue or black pen on both sides of the paper.
You may use an HB pencil for any diagrams, graphs, tables or rough working.
Do not use staples, paper clips, 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 in the spaces provided on the Question Paper.

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

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.

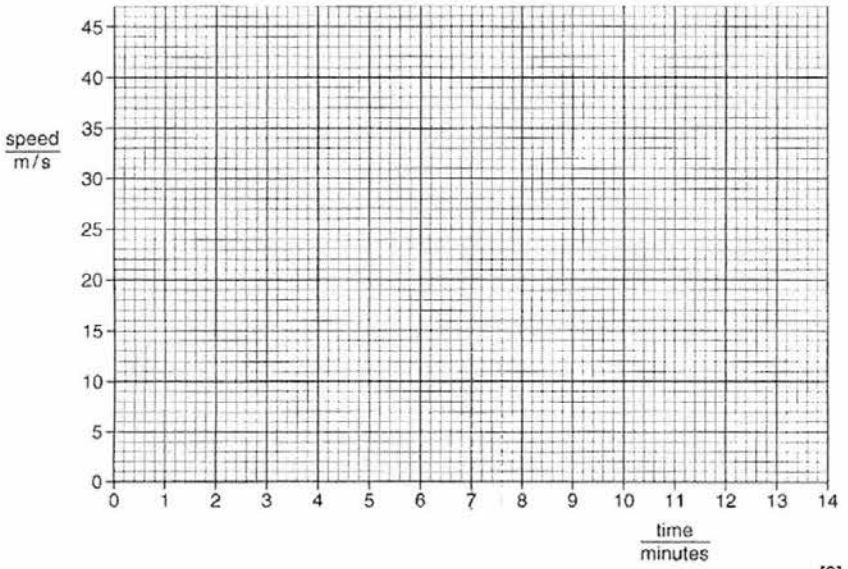
After checking of answer script		
Checked by	Signature	Date
Student		

FOR EXAMINER'S USE	
Section A	
B___	
B___	
TOTAL	

This document consists of **17** printed pages including this cover page

Section A
Answer all the questions in the spaces provided.

1 A car travels at constant speed of 10 m/s for 2.0 minutes. It then accelerates uniformly at 0.05 m/s^2 for 8.0 minutes. After that, the car moves with increasing deceleration until it comes to rest in 3.0 minutes.
In the figure, plot a graph to show the variation with time of the speed of the car.



[3]

2 **(a)** State an electromagnetic wave whose frequency is higher than x-ray.

.....[1]

(b) Besides being a transverse wave, state two other properties of the electromagnetic wave you have stated in part (a).

.....

.....[2]

(c) State the electromagnetic wave which is used in

(i) intruder alarms .....

(ii) satelite communication .....[2]

3 Fig. 3.1 shows a simple tool to punch holes in a sheet of material. The handle is pushed down to produce the hole.

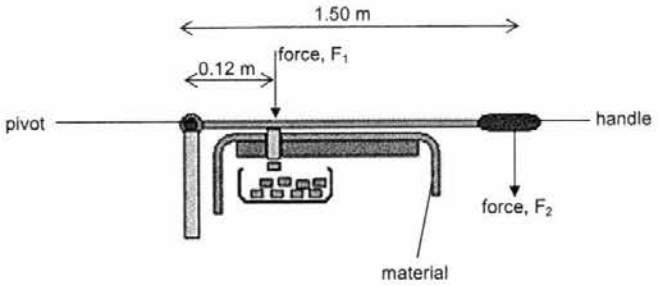


Fig. 3.1

(a) Calculate the punch force F_1 produced when the applied force, F_2 is 2.0 N.

force F_1 = ... N [1]

(b) Describe and explain one way we can modify the tool so that it can be used to punch through a tougher material using the same force, F_2 of 2.0 N.

.....

.....

.....

.....[2]

4 **(a)** State two methods that can be used to increase stability.

1. .....

2. .....[2]

(b) Fig 4.1 shows a figurine of a martial artist adopting a basic stance. Fig 4.2 shows the figure being tilted by a force applied to the side.

Fig. 4.1

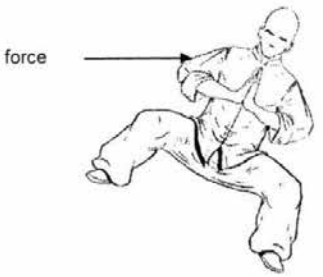


Fig. 4.2

Explain why the figurine will not topple over when the force is removed.

.....

.....

.....

.....[2]

5 Fig. 5.1 shows a mechanical digger used to remove soil from the ground.

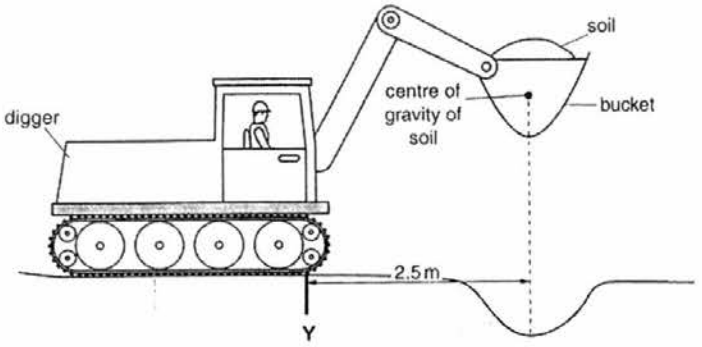


Fig. 5.1

The bucket holds 3600 kg of soil and the centre of gravity of the soil is at a distance from the front edge **Y** of the tracks in contact with the ground. The soil is raised by a vertical distance of 2.0 m in 1.5 s.

(a) Determine the weight of the soil per bucket.

weight = ...N [2]

(b) Determine the gravitational potential energy gained by the soil.

energy = ...J [2]

(c) Determine the power exerted by the digger on the soil.

power = ...W [2]

6 **RA**dio **D**etection **A**nd **R**anging (**RADAR**) has many applications. It is a system used to detect and determine the distance of objects such as aircrafts. Strong radio waves are transmitted and a receiver listens for any echoes.

Fig. 6.1 shows an aircraft flying towards the radar station.

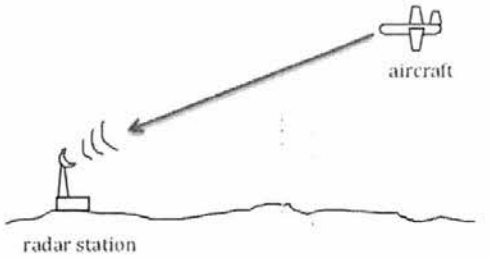


Fig. 6.1

Fig. 6.2 shows the display of the wave. **A** represents the pulse of the emitted radio waves while **B** represents the pulse of the echo.

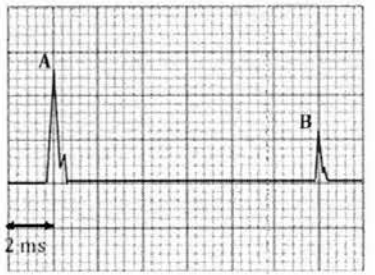


Fig. 6.2

(a) State the speed of radio waves.

speed = ... m/s [1]

(b) Determine the distance of the aircraft from the radar station.

distance = ... m [2]

(c) Two minutes later, pulses **A** and **B** are only 10 ms apart. Determine the speed of the aircraft.

speed = ... m/s [2]

(d) Explain why sound waves cannot be used to replace radiowaves in this application.

.....

.....

.....[2]

7 Fig. 7.1 shows the image **I** of an object **O** produced by a converging lens.

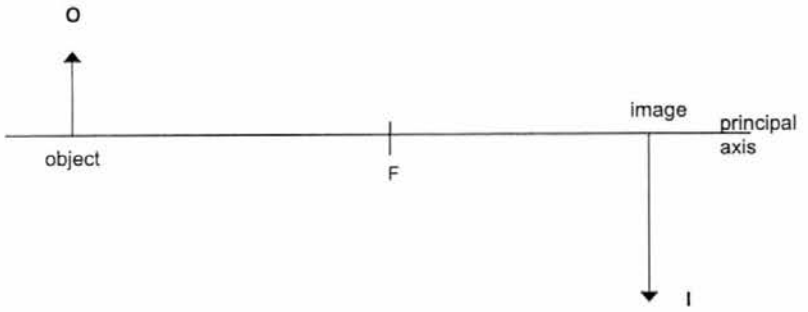


Fig. 7.1

(a) **(i)** Draw a ray to locate the converging lens. Label it as L. [1]

(ii) Draw a ray from the object that passes through focal point F on the diagram. [1]

(b) Other than being enlarged, write down two other properties of the image.

.....[1]

8 Table 8.1 shows a list of appliances used by a particular household in a month of 30 days.

Appliance	Power Rating	Resistance	Time used per day
Fan	120 W	5.0 Ω	5.0 h
Air-conditioner	3.0 kW	20 Ω	4.0 h

Table 8.1

(a) The electrical cost is 25 cents per kWh. Calculate the electricity bill for the fan in this month. Express your answer in dollars.

cost = $..... [2]

(b) The operating voltage for a Singapore household's electrical system is 240 V. The fuse connecting the air-conditioner to the mains blew. Determine the minimum rating of the fuse that the family needs to get to replace the blown fuse.

fuse rating = ... [2]

9 Fig. 9.1 shows an electric circuit.

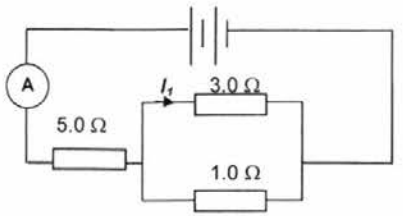


Fig. 9.1

(a) Calculate the effective resistance of the circuit.

effective resistance = ...Ω [1]

(b) Given that current I_1 is 0.50 A, find the reading in the ammeter.

ammeter reading = ...A [2]

(c) Calculate the e.m.f. of the battery.

e.m.f. = ...V [2]

10 Fig. 10.1 below shows a type of lock which can be operated from a remote switch. The coil is wound around a soft iron core.

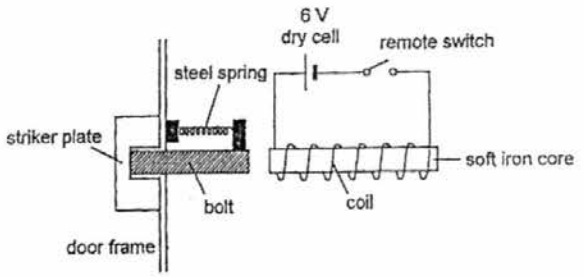


Fig. 10.1

When the switch is closed, the bolt, which is made of steel, moves to the right and out of the striker plate, allowing the door to be opened.

(a) Explain why the bolt moves to the right when the switch is closed.

.....

.....[2]

(b) State and explain what might happen differently if iron core is replaced with steel.

.....

.....[2]

(c) A maintenance worker accidentally reverses the polarity of the dry cell. State, with a reason, whether the lock will still work.

.....

.....[1]

Section B

Answer any **two** questions in this section.
Write your answers in the spaces provided.

11 Ben is driving a car and sees an accident ahead, he stepped on the brakes. During the reaction time, the car travels at a steady speed and covers a distance known as the thinking distance. The braking distance is the distance travelled by the car after the brakes are applied.

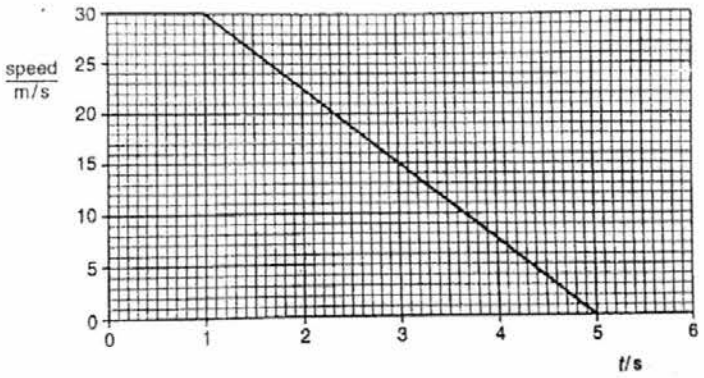


Fig. 11.1

Fig. 11.1 shows the speed-time graph of a car. Ben sees the accident at time t=0 s. The total mass of the car and the driver is 800 kg.

(a) State the energy change that occurs as the car brakes.

.....[1]

(b) Determine

(i) the braking distance,

distance = ... m [1]

(ii) the deceleration of the car while the brakes were being applied,

deceleration = ... m/s^2 [2]

(iii) the frictional force acting on the car if the engine force is 8000 N.

force = ... N [2]

(c) State and explain how the braking distance is affected by using new tyres rather than badly worn tyres.

.....

.....

.....

..... [3]

(d) Sketch on Fig. 11.1, the speed-time graph from 1 s onwards after the brakes are applied if the car is carrying a heavier load of passengers. [1]

12 **(a)** Fig. 12.1 shows a ray of light entering at the face of AB of the right angled glass prism. The refractive index of the glass is 1.49. The figure is not drawn to scale.

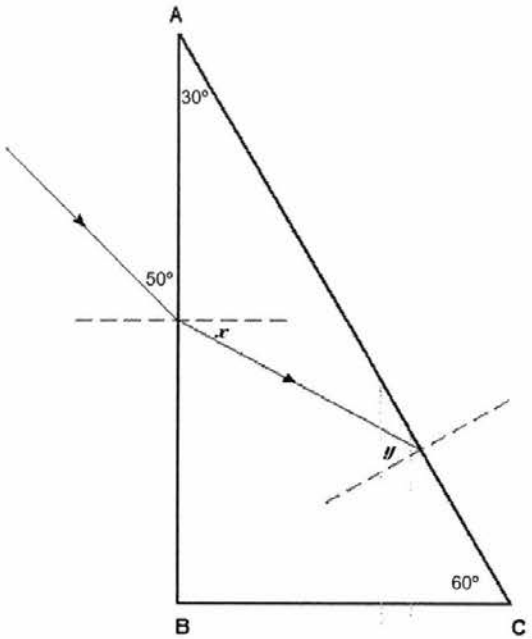


Fig. 12.1

(i) Calculate the angle of refraction *x* at side AB.

angle of refraction = ... [2]

(ii) Calculate the angle of incidence *y* at side AC.

angle = ... [1]

(iii) Determine the crictical angle of the glass.

critical angle = ... [1]

(iv) Sketch on Fig 12.1, what will happen to the light ray after it hits side AC? [1]

(v) Explain your answer to part **(iv)**.

.....

.....[1]

(b) Fig. 12.2 shows a magnetic material ***X*** and a permanent magnet **Y**.

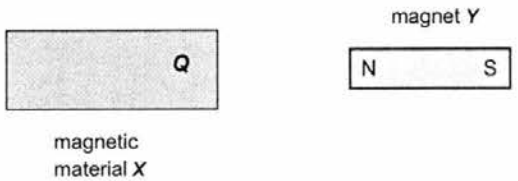
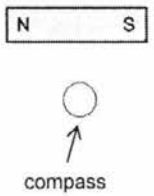


Fig. 12.2

(i) State the polarity of the induced magnet at point **Q**.

.....[1]

(ii) Draw in the figure below, the magnetic field of the magnet and the direction of the pointer in the compass. [3]



13 **(a)** An experiment is set up as shown in Fig. 13.1 to determine the total amount of energy required to heat the liquid X from a temperature of 25 °C to 70 °C. A joule meter is used to measure the energy given out by the heater. The heater is switched on for 300 s and then switched off.

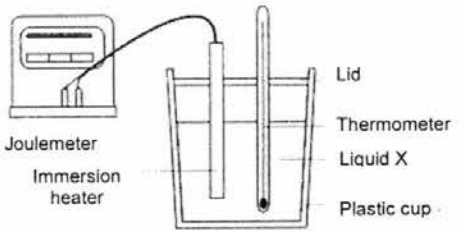
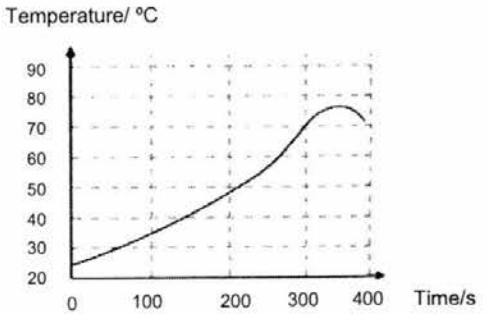


Fig. 13.1

The variation of temperature of the liquid X with time is plotted in the graph below.



(i) Explain the function of a lid and why a plastic cup is used.

.....

.....

.....

.....[2]

(ii) If the outer layer of the plastic cup is painted black, state and explain whether the results obtained will be more accurate.

.....

.....

.....

.....[2]

(iii) Explain why the temperature of X continue to rise for a while after the heater is switched off.

.....

.....

.....

.....[2]

(b) Fig. 13.2 shows a metal saucepan, containing water, placed on a flat electric hot plate.

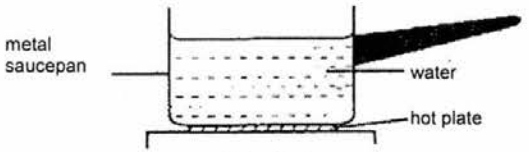


Fig. 13.2

(i) State the process by which heat energy is transferred through the base of the saucepan.

.....[1]

(ii) Water is a poor thermal conductor. Describe clearly how all the water gets heated inside the saucepan.

.....

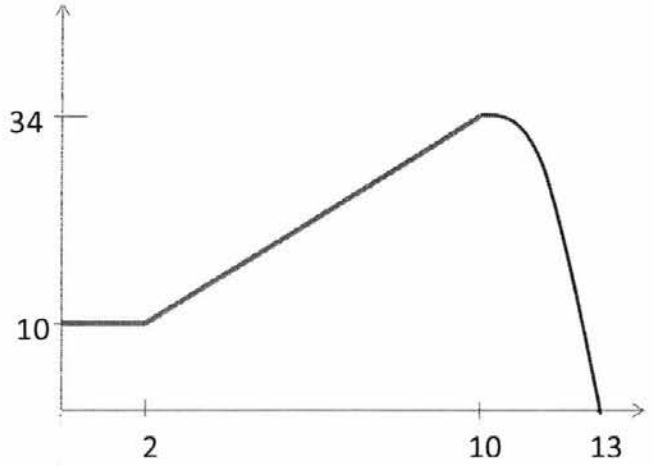
.....

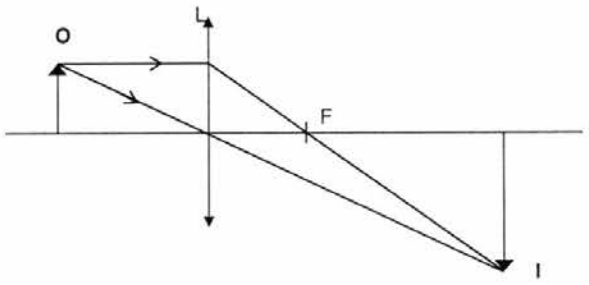
.....

.....[3]

Jurong West Secondary School
Preliminary Examination 2016
Mark Scheme

Secondary Four Express / Five Normal (Academic)
SCIENCE (PHYSICS) 5076
PAPER 2
Section A

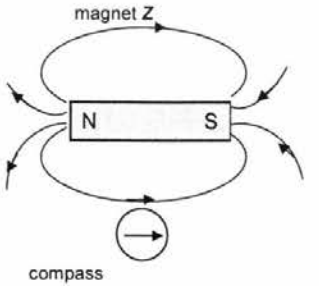
1		 1 m for each section with correct values and shape Accept decreasing curve.	3
2	a	gamma ray	1
	b	Speed of $3x10^8$ m/s through vacuum Not affected by electric or magnetic fields (1m for one answer) (any two answers)	2
	c	Infrared radiation.	1
		Microwave	1
3	a	$F_1(0.12) = 2\ (1.50)$ $F_1 = 25$ N [1]	1
	b	lengthen the handle [1] as moment is the product of force and the perpendicular distance from the pivot. By lengthening the handle, **the perpendicular distance is increased,** hence **increasing the force** acting on the tougher material. [1]	2
4	a	Centre of gravity should be kept as low as possible [1] Its base area should be kept as wide as possible. [1]	2
	b	**Vertical line-of-action** of the weight of the figurine **through the centre of gravity lies inside the base area** of the figurine.[1] **Anticlockwise moment** of the weight **about the point of contact (pivot)** causes the figurines to **return to its original position.**[1]	2
5	a	Weight = mg [1] = 3600 x 10 = 36000 N [1]	2
	b	GPE = mgh [1] = 3600 x 10 x 2.0 = 72000 J[1]	2
	c	Power = change in energy / time taken [1] = 72000 / 1.5	2

		= 48000 W[1]	
6	a	3×10^8 m/s	1
	b	Distance = (speed x time) /2 [1] $= 3 \times 10^8 \times 0.012/2$ = 1 800 000 m [1]	2
	c	Distance after two minute = $(3 \times 10^8) \times (10 \times 10^{-3}) / 2$ = 1 500 000 m [1] Speed = (1 800 000 – 1 500 000) / 120 = 2500 m/s [1]	2
	d	Sound wave has a speed of 330 m/s [1] as it travels slower than speed of light. [1]	2
7	a(i) a(ii)	 correct marking of position L [1] correct drawing of ray [1]	4
	b	Inverted and real	1
8	a	Total energy = (0.12 x 5) x 30 = 180kWh[1]	2

		Cost = 18 x 0.25= $4.50 [1]	
	b	P= VI 3000 = 240 I I = 12.5 A [1] Minimum fuse rating = 13 A [1]	2
9	a	Effective R = $5.0 + (1/3 + 1/1)^{-1}$ = 5.75 Ω	1
	b	Current in 1 Ω resistor = 0.5 x 3 = 1.5 A [1] Ammeter reading = total current in the circuit = 0.50 + 1.5 =2.0 A [1]	2
	c	V = I x R [1] = 2.0 x 5.75 =11.5 V (allow ecf) [1]	2
10	a	The soft iron core is magnetised [1] and it attracted the bolt which is a magnetic material [1] hence the bolt moves to the right.	2
	b	Steel is hard to magnetized [1] as compared to soft iron. Hence is it might not be able to attract the bolt. [1]	2
	c	The lock will still work as the soft iron can still be magnetised	1

Section B

11	a	Kinetic energy →heat energy & sound energy	1
	bi	BD = 0.5 x 4 x 30 = 60 m	1
	bii	deceleration = (u-v)/t [1] = (30 – 0) / 4 = 7.5 m/s^2 [1]	2
	biii	F = ma [1] = 800 x (-7.5) = -6000 N Frictional force = 8000 + 6000 = 14000 N [1]	2
	ci	Braking distance decreases [1] because friction between the road and the tyres increases.[1] hence deceleration increases. [1]	3
	cii	A gentler slope	1
12	ai	1.49 = sin 40° / sin *x* [1] *x* = 25.6° [1]	2
	aii	*y* = 55.6° allow ecf from ai	1
	aiii	Critical angle = sin^{-1}(1/1.49) = 42.2° [1]	1
	aiv	Hence light ray will be internally reflected at XZ (or TIR will take place at XZ)	1
	av	As the angle of incidence has exceeded the critical angle. [allow ecf from aiv]	1
	bi	south pole	1

	bii and biii	 Correct profile and direction for magnetic field lines [2] Correct direction of compass [1]	3
13	ai	The **lid** is to reduce heat loss to the surrounding by **convection and evaporation**. [1] **Plastic** is a **poor conductor of heat** so it can reduce heat loss to the surrounding **by conduction**. [1]	2
	aii	No [1] It will **speed up the rate of heat loss** to the surrounding as black is a good emitter of heat as the result obtained will not be accurate. [1]	2
	aiii	Although the electrical energy is no longer being transformed into heat energy, **the heater is still at a higher temperature or heater is still hot** [1] and **heat continues to be transferred to liquid X** [1] from the heater until the heater cools to the same temperature as liquid X.	2
	bi	Conduction	1
	bii	The water at the bottom of the copper base heats up, expands, and **rises as it has lower density** [1], while the cold water at the	3

		top **sinks due to the higher density** [1]. This **creates a convection current** [1] which heats up all the water inside the saucepan.	

Name: _____ Class _____ Index Number _____

Jurong West Secondary School

Preliminary Examinations 2016

SCIENCE(PHYSICS/CHEMISTRY) 5076/05

Secondary Four Express/Five Normal (Academic) **17 August 2016**

Paper 5 **1 hour 30 minutes**

Candidates answer on the Question Paper. No Additional Materials are required.

READ THESE INSTRUCTIONS FIRST

Write your name, class and index number on all the work you hand in.
Write in dark blue or black pen.

You may use an HB pencil for any diagrams, graphs, tables or rough working.

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

The use of an approved scientific calculator is expected, where appropriate.
You may lose marks if you do not show your working or do not use appropriate units.

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

At the end of the examination, **hand in each section separately**.

The number of marks is given in brackets [ ] at the end of each question or part question.
A copy of the Data Sheet is printed on page 8.

After checking of answer script		
Checked by Student	**Signature**	**Date**

For Examiner's Use	
Q1	
Q2	
Total	

This document consists of **8** printed pages.

1 In this experiment, you will investigate the length of a loaded spring as the load is varied.

(a) (i) Support the metre rule as shown in Fig. 1.1.

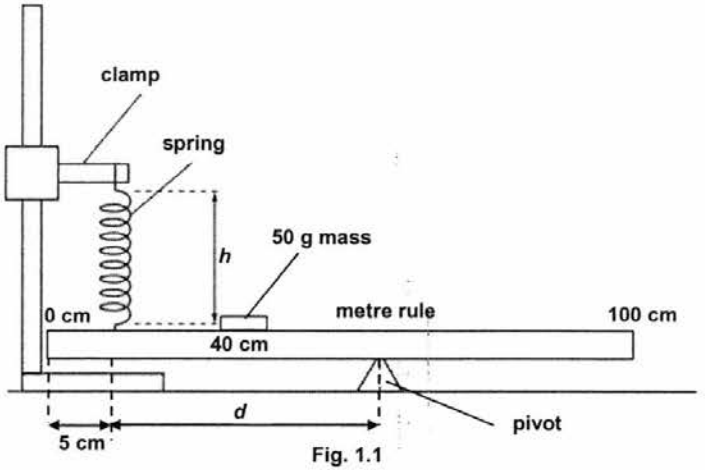


Fig. 1.1

(ii) Adjust the position of the spring to be 5 cm away from the 0 cm mark of the metre rule. Do not adjust the position of the spring throughout the experiment.

(iii) Place a 50 g mass at the 40 cm mark on the metre rule. Do not adjust the position of the mass throughout the experiment.

(iv) Adjust the position of the pivot so that ***d*** is 50 cm.

(v) Adjust the clamp so that the metre rule is horizontal and the spring is vertical.

(b) Measure and record the length ***h*** of the coiled part of the spring.

h = ...cm [1]

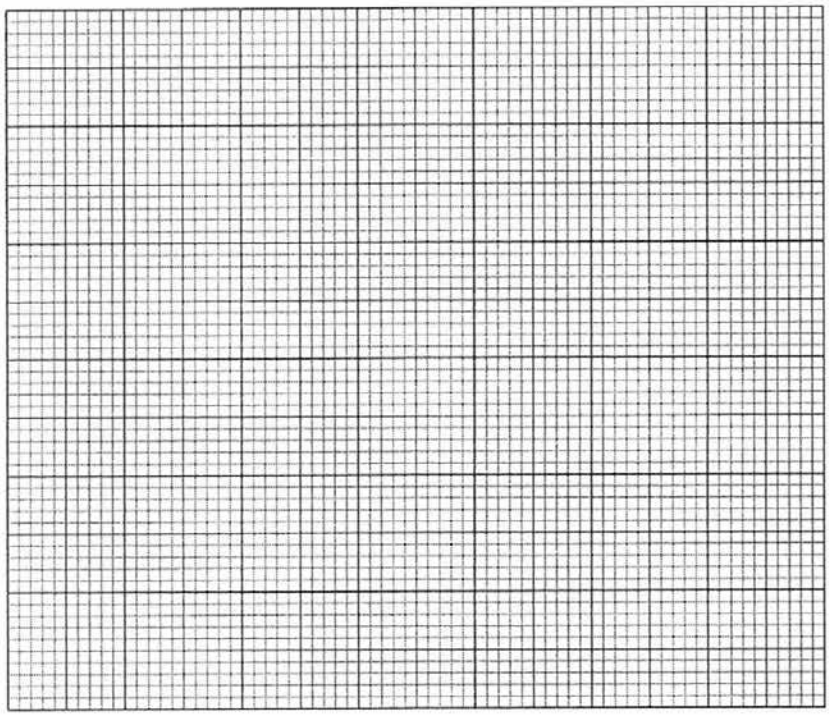
(c) Repeat **(a)(iv)**, **(a)(v)** and **(b)** for different values of ***d***. Calculate values of 1/***d*** in your table of results.

d / cm	***h*** / cm	1/***d*** / 1/ cm
50.0		
60.0		
70.0		
80.0		
90.0		

[3]

(d) (i) Plot a graph of h on the y-axis against $1/d$ on the x-axis.

(ii) Draw the line of best fit.



[4]

(e) Determine the gradient and *y*-intercept of this line.

gradient = ...[2]

y-intercept = ...[1]

(f) Determine from your graph, the height h when d is 65 cm.

h = ...[1]

(g) It is suggested that the relationship between d and h is

$$h = \frac{gradient}{d} + B$$

where ***gradient*** and B are constants.

$$gradient = \frac{Wz}{k}$$

where W is the weight of the metre rule = 0.075 kg

k is the spring constant of the spring = 0.45

and z is a constant.

Use your answer from **(e)** to calculate z.

z = ...[1]

(h) (i) Identify **one** source of error for this experiment.

.....

.....[1]

(ii) Suggest an improvement for the experiment which would reduce the error in **(h)(i).**

.....

.....[1]

Name: _____ Class _____ Index Number _____

Jurong West Secondary School

Preliminary Examinations 2016

SCIENCE(PHYSICS/CHEMISTRY) **5076/05**

Secondary Four Express/Five Normal (Academic) **17 August 2016**

Paper 5 **ANSWER SCHEME** **1 hour 30 minutes**

Candidates answer on the Question Paper. No Additional Materials are required.

READ THESE INSTRUCTIONS FIRST

Write your name, class and index number on all the work you hand in.

Write in dark blue or black pen.

You may use an HB pencil for any diagrams, graphs, tables or rough working.

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

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

You may lose marks if you do not show your working or do not use appropriate units.

Answer **both** questions.

You are advised to spend 45 minutes on each question.

At the end of the examination, **hand in each section separately**.

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

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

After checking of answer script		
Checked by Student	**Signature**	**Date**

For Examiner's Use	
Q1	
Q2	
Total	

This document consists of **8** printed pages.

[Turn over

1 In this experiment, you will investigate the length of a loaded spring as the load is varied.

(a) (i) Support the metre rule as shown in Fig. 1.1.

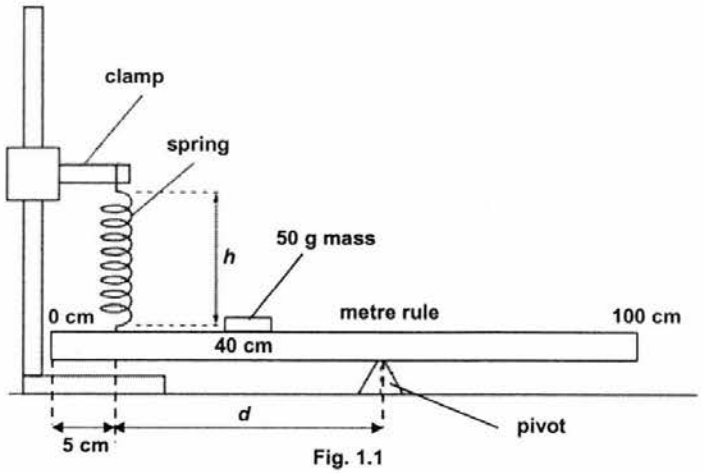


Fig. 1.1

(ii) Adjust the position of the pivot so that ***d*** is 50 cm.

(iii) Place a 50 g mass at 40 cm mark on the metre rule. Do not adjust the position of the mass throughout the experiment.

(iv) Adjust the position of the spring to be 5 cm away from the 0 cm mark of the metre rule. Do not adjust the position of the spring throughout the experiment.

(v) Adjust the clamp so that the metre rule is horizontal and the spring is vertical.

(b) Measure and record the length ***h*** of the coiled part of the spring.

h = ...7.1.....cm [1]

(c) Repeat **(a)(ii), (a)(v)** and **(b)** for different values of ***d***. Calculate values of 1/***d*** in your table of results.

d / cm	***h*** / cm	1/***d*** / 1/ cm
50.0	**7.1**	**0.0200**
60.0	**7.2**	**0.0167**
70.0	**8.0**	**0.0143**
80.0	**8.8**	**0.0125**
90.0	**9.5**	**0.0111**

[3]

1 m – increasing trend for h 1m for correct 1/d calculation 1m for 3sf

(d) (i) Plot a graph of ***h*** on the y-axis against 1/***d*** on the x-axis.

(ii) Draw the line of best fit.

[4]

1m – axis with label
1m – at least 3 correctly plotted points
1m – appropriate scale used
1m – line of best fit (decreasing trend)

(e) Determine the gradient and *y*-intercept of this line.

Gradient calculation and answer - 2m

y-intercept using y = mx + c - 1m

gradient = ...- 235 .....[2]

y-intercept = ...9.89.....[1]

(f) Determine from your graph the height ***h*** when ***d*** is 65 cm.

Indication on graph at 1/d = 1 / 65 = 0.015 , reading of h = 8.15 cm

h = ...8.15 cm.....[1]

(g) It is suggested that the relationship between ***d*** and ***h*** is

where ***gradient*** and ***B*** are constants.

$$gradient = \frac{Wz}{k}.$$

where ***W*** is the weight of the rod = 0.075 kg

k is the spring constant of the spring = 0.45

and ***z*** is a constant.

Use your answer from **(e)** to calculate ***z***.

Correct calculation of z - 1 m

z = ...-1425.....[1]

(h) (i) Identify **one** source of error for this experiment.

Ruler is not horizontal ,
spring is not vertical .
mass of metre rule is not uniform [1]

(ii) Suggest an improvement for the experiment which would reduce the error in **(h)(i).**

Use a set square to ensure ruler is horizontal to the table
measure at specific distances of metre rule from bench surface to ensure same distance.
Check metre rule CG is exactly at 50 cm mark . if not Place blue tacks on ruler to ensure its weight acts at centre. [1]