中正中学 义顺

CHUNG CHENG HIGH SCHOOL YISHUN

Preliminary Examination 2015

Secondary 4 Express/5 Normal (Academic)

Candidate	Name	Register No	Class

Science Physics

Paper 1

5116, 5076, 5077

Date: 31 Aug 2015

Duration: 1 h

(with Chemistry/Biology)

READ THESE INSTRUCTIONS FIRST

Answer all questions in the OMS provided

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

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

For examiner's use
20

Setter: Mr Tan TS

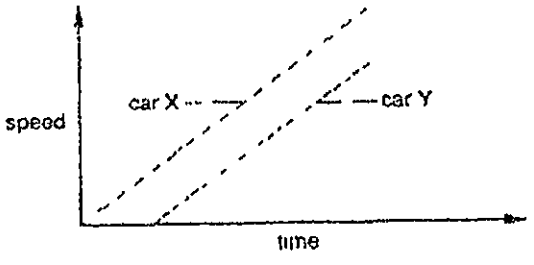
This paper consists of 8 printed pages, INCLUDING the cover page

1 A student uses a vernier calipers to measure the diameter of a wooden cylinder
The diagram shows an enlargement of the caliper scales

What is the radius of the cylinder?

(A) 2 40 cm
(B) 1 64 cm
(C) 0 82 cm
(D) 0 42 cm

2 The graph shows the speed of two cars over a period of time

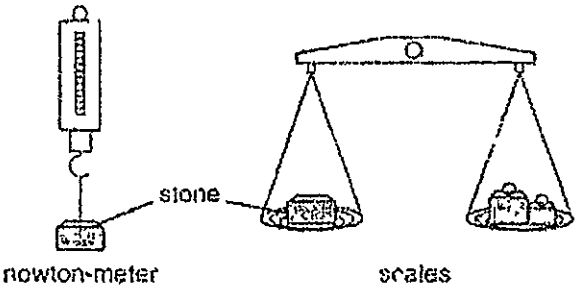


From the information in the graph, which statement is correct?

(A) Car X accelerates at the same rate as car Y
(B) Car X and car Y always travel at constant speed
(C) Car X is more powerful than car Y
(D) Car X starts at a faster speed than car Y

3 A lump of stone is weighed using a newton-meter (spring balance) and a pair of scales
This experiment is repeated on the Moon Are the readings for each balance the same or different when taken on Earth and on the Moon?

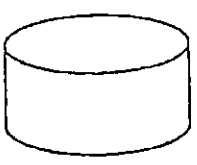
	on newton-meter	on scales
(A)	different	same
(B)	different	different
(C)	same	different
(D)	same	same

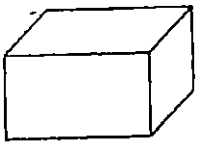


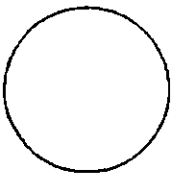
(B)
Cylinder
Radius = 10 cm
Height = 40 cm
Mass = 800 g

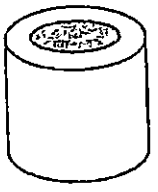
(D)
Rectangular block
Length = 15 cm
Breadth = 10 cm
Height = 20 cm
Mass = 5000 g

4 Which object below has the highest density?

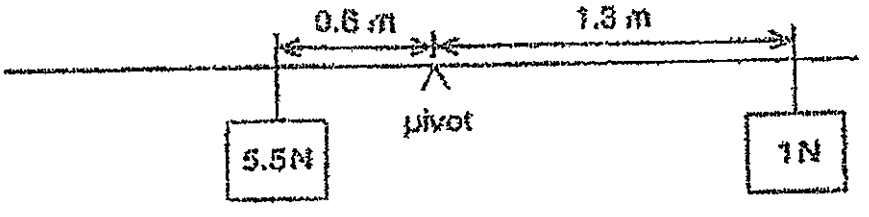








5 The diagram shows a light rod with two weights hanging from it



A third weight is to be added to bring the system into equilibrium so that the rod is balanced What weight is required and where should it be placed?

	Weight	Position
(A)	1 N	2 m to the left of the pivot
(B)	1 N	3 m to the right of the pivot
(C)	2 N	1 m to the left of the pivot
(D)	2 N	1 m to the right of the pivot

Time / min

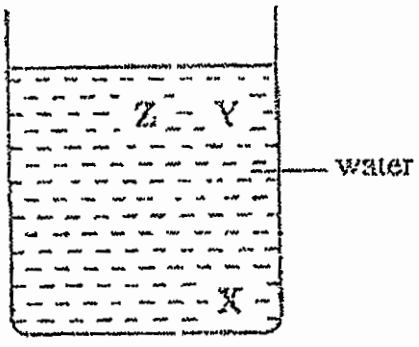
6 In an oil refinery, petrol storage tanks are painted with a light colour to reduce

(A) energy gain by radiation
(B) energy gain by convection
(C) energy loss by conduction
(D) energy loss by radiation

Temperature / °C

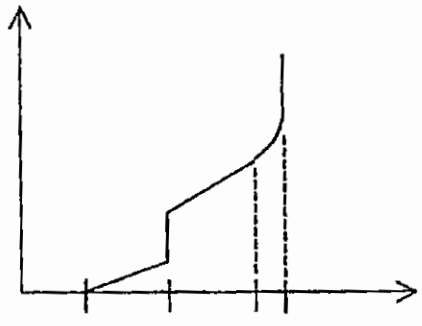
(A) (B) (C) (D)

7 A teacher has a large metal tank of water in which he wants to set up a convection current Which of the following arrangements would do this?



(A) Heating at Y
(B) Heating at Z
(C) Cooling at X
(D) Cooling at Y

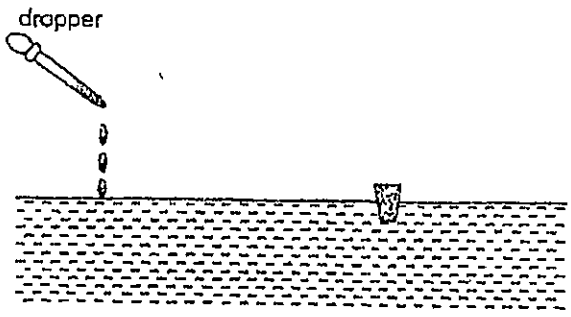
8 Some ice cubes are taken from a deep-freezer and placed in a metal container The container is heated at a steady rate and the temperature change over time are taken The results are recorded on a graph Which temperature below corresponds to 0 °C?



9 A note is played on a piano with a frequency of 50 Hz Sound travels at 300 ms^{-1} in air What is the wavelength of the note?

(A) 6 m
(B) 50 m
(C) 250 m
(D) 300 m

10 A cork floats in water and a dropper is used to produce circular water waves as shown below



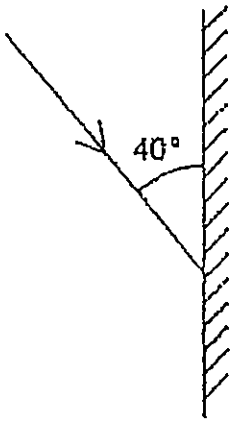
Which of the following describes the motion of the cork correctly when the waves pass through it?

(A) It vibrates vertically about its original position
(B) It moves towards the dropper
(C) It moves away from dropper
(D) It remains stationary

11 Which set of information about sound waves is correct?

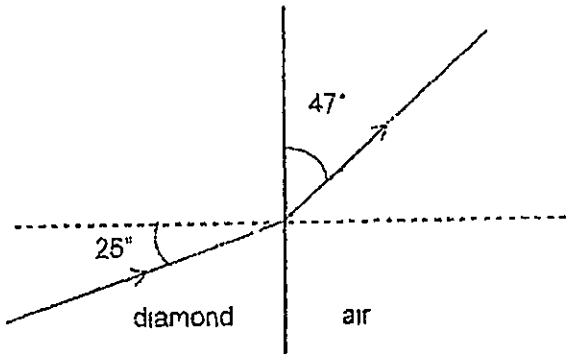
	nature of wave	speed in glass, in ms^{-1}
(A)	longitudinal	5 000
(B)	longitudinal	300 000 000
(C)	transverse	5 000
(D)	transverse	300 000 000

12 The diagram shows a single ray of light being directed at a plane mirror What are the angles of incidence and reflection?



	Angle of incidence°	Angle of reflection°
(A)	40	40
(B)	40	50
(C)	50	40
(D)	50	50

13 The diagram shows a ray of light travelling from diamond into air



What is the refractive index of the diamond?

(A) 0 58
(B) 0 81
(C) 1 61
(D) 1.73

14 A torch bulb uses a 3V supply and takes a current of 0 2A It is switched on for one minute How much electrical energy is used?

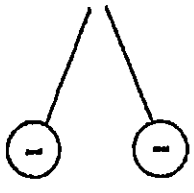
(A) 0.6 J
(B) 12 J
(C) 36 J
(D) 180 J

15 An object has a charge of 120 C It was connected to the earth where it was fully discharged If the all the charges are discharged from it in 4 minutes, what is the average current?

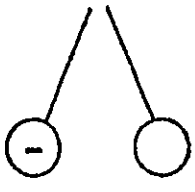
(A) 0 5 A
(B) 2 0 A
(C) 30 A
(D) 480 A

16 Eight spheres, four negatively charged, two positively charged and two neutral were paired and placed near one another. Which of the following scenarios is incorrectly described?

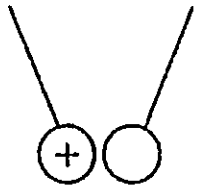
(A)



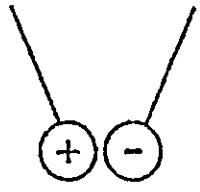
(B)



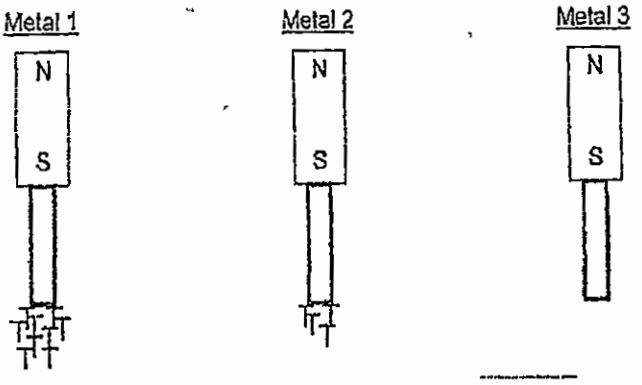
(C)



(D)



17 A magnet was used to distinguish 3 metal bars - copper, iron and steel The following diagram illustrates the number of pins picked up by each metal bar when they are held together with the magnet Name the metals

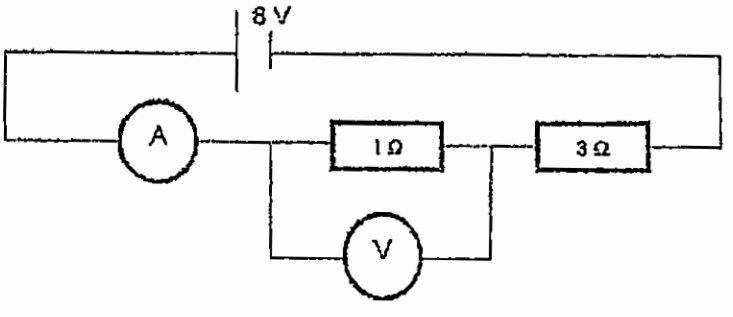


	Metal 1	Metal 2	Metal 3
(A)	Copper	Steel	Iron
(B)	Iron	Copper	Steel
(C)	Steel	Iron	Copper
(D)	Iron	Steel	Copper

18. Which of the following changes will double the resistance of a wire?

	Cross-sectional area	Length
(A)	double	double
(B)	double	no change
(C)	halve	halve
(D)	halve	no change

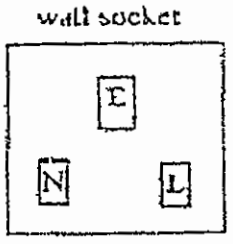
19 What are the readings of the ammeter and voltmeter of the following circuit?

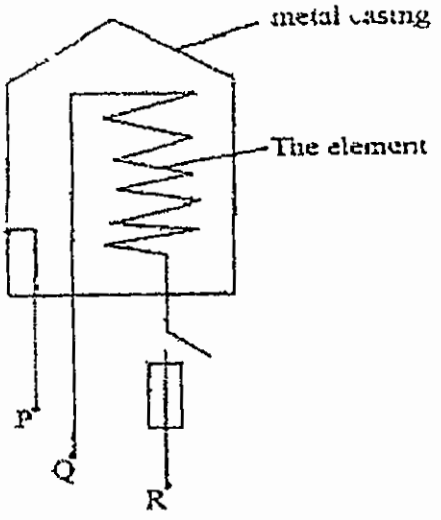


	Ammeter reading / A	Voltmeter reading / V
(A)	2	2
(B)	2	6
(C)	2	8
(D)	4	8

20 The figure shows an electrical appliance which is to be connected to a power supply (E = earth, N = neutral and L = live)

Fig





To which hole of the socket must each of the wires P, Q and R be connected?

	P	Q	R
(A)	E	N	L
(B)	E	L	N
(C)	N	E	L
(D)	N	L	E

中正中学 义顺

CHUNG CHENG HIGH SCHOOL YISHUN

Preliminary Examination 2015

Secondary 4 Express/5 Normal (Academic)

Candidate Name | Register No | Class

Science Physics
Paper 2

Date: 26 Aug 2015
Duration: 1 hr 15 min

READ THESE INSTRUCTIONS FIRST

Section A (45 marks)

Answer all questions in the spaces provided

Section B (20 marks)

Answer any TWO questions in the writing papers provided

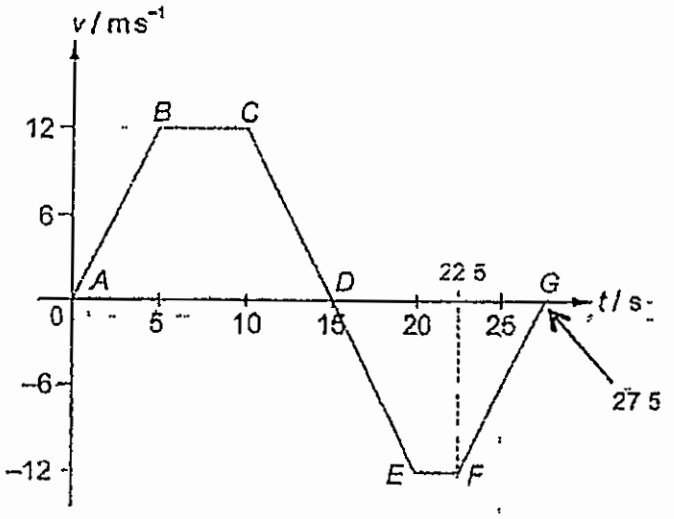
For examiner's use
65

Setter: Mr Tan TS

This paper consists of 11 printed pages, INCLUDING the cover page.

Section A (45 marks)
Answer ALL questions in this section in the spaces provided

1 The following is the velocity-time graph of a car

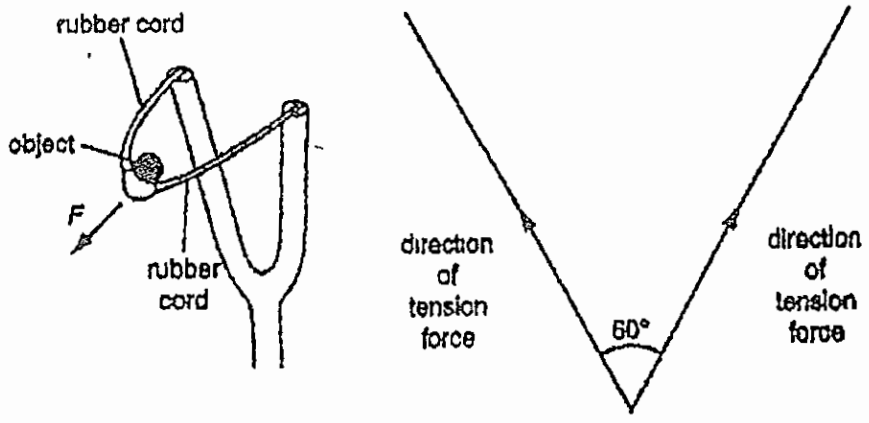


(a) Find the acceleration of the car during the first 5 s of motion [2]

(b) Find the acceleration of the car at $t = 15$ s [2]

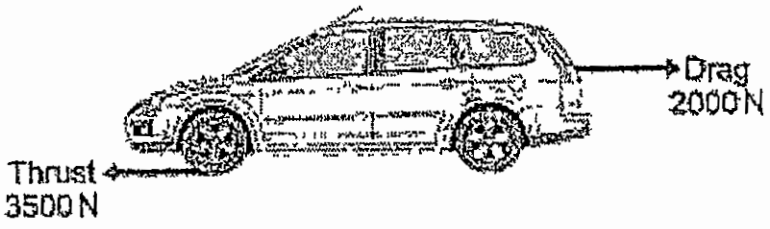
(c) Find the total distance travelled by the car [2]

2 The figure below shows a catapult used to project an object Force F pulls back the object, creating a tension in the rubber cords



The tension force in each rubber cord is 20 N and the two cords are 60° to each other as shown in the figure. By making a scale drawing of 1 cm 4 N, find the resultant of these two tension forces acting on the object. [3]

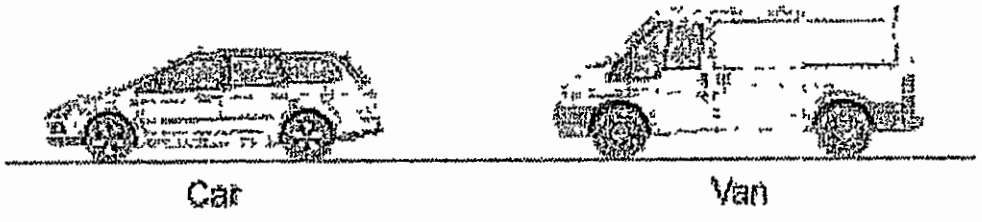
3 (a) The diagram shows the horizontal forces acting on a car of mass 1200 kg
At the instant shown, the car is accelerating



Calculate the acceleration of the car at the instant shown in the diagram [2]

(b) Explain why the car eventually reaches a top speed even though the thrust force remains constant at 3500 N. [3]

(c) The diagram shows a car and a van.



The two vehicles have the same mass and identical engines [3]

If both undergo acceleration at the same time along the same stretch of road, explain why the top speed of the car will be greater than the top speed of the van

4 Fig 4 1 shows a support for a leg in plaster and Fig 4 2 shows a simplified diagram of the forces acting on the leg

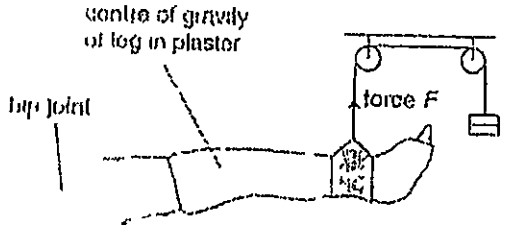


Fig 4 1

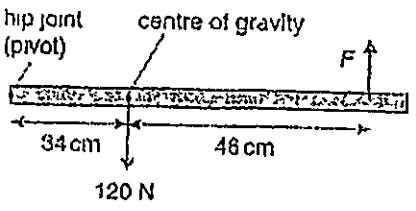


Fig 4 2

Calculate the force F needed to keep the leg in a horizontal position [2]

5 Fig 5 1 shows one way that biscuit manufacturers cook large quantities of biscuits. The uncooked biscuits are placed on a moving metal grid The biscuits pass between two hot electrical heating elements inside an oven The biscuits turn brown as they cook

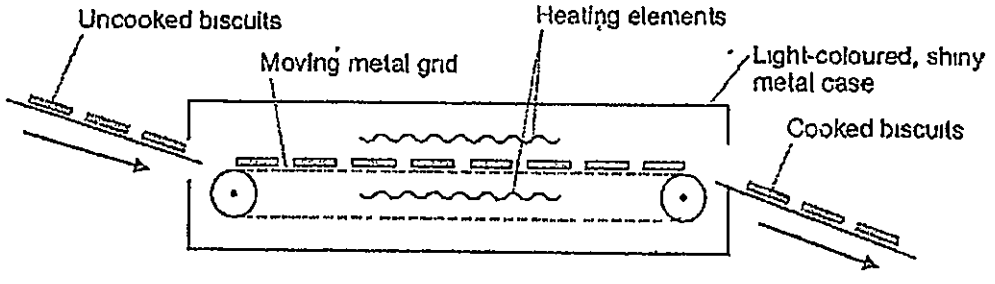


Fig 5 1

The oven has two control knobs, as shown in Fig 5.2.

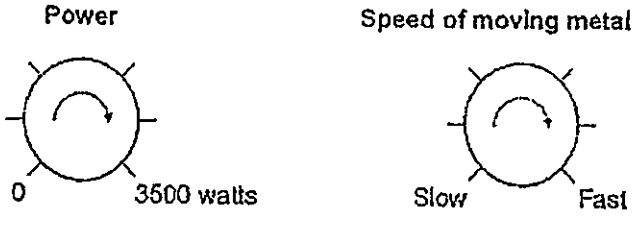


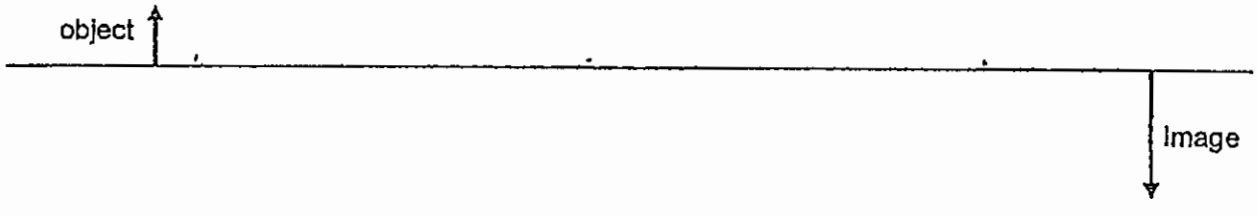
Fig 5 2

(a) Which type of electromagnetic radiation makes the biscuits turn brown? [1]

(b) By referring to both Figs 5.1 and 5 2, suggest TWO ways of cooking the biscuits in this oven, to make them turn browner [2]

(c) The inside and outside surfaces of the oven are light-coloured and shiny Explain why [3]

6 (a) Complete the diagram below, by drawing TWO suitable rays to show how the converging lens forms an image of the object Clearly mark the position of the optical centre, O and the principle focal point, F [2]



(b) Name the optical device which uses a converging lens to produce an image of this description. [1]

(c) Describe how the image will change when the object is moved slightly to the left [1]

7 A man who is standing at a point P between two parallel walls as shown in Fig 7 The distance of P is 99 m from the nearer wall He fires a starting pistol

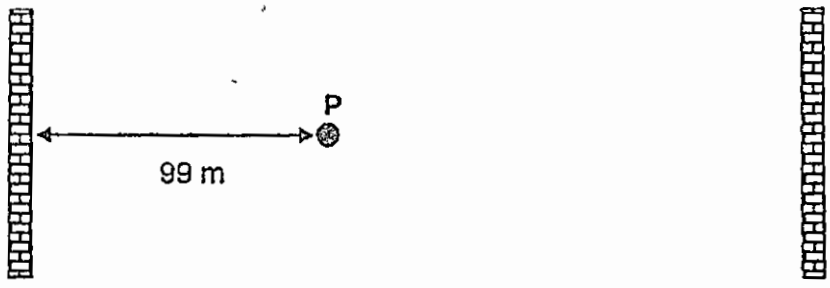


Fig 7

(a) What type of wave is sound wave? [1]

(b) Give your reason why sound is categorized as this type of wave [1]

(c) Calculate the speed of sound in air if the man hears the first echo after 0 6 seconds. [2]

(d) If he hears another echo after 0 8 s, what is the total distance between the two parallel walls? [2]

8 An electric kettle designed to be operated from a 240 V supply has a power rating of 1680 W

(a) Calculate the size of the current when the kettle is being used. [2]

(b) Suggest a suitable rating for a fuse to be used with this kettle from the following available fuses 5 A, 10 A and 13 A [1]

_____

(c) In the normal operation of the electric kettle, write down the size of the current in

(i) the live wire, _____ A, and [1]

(ii) the earth wire _____ A [1]

9 (a) Fig 9 1 shows a straight wire between the poles of a magnet The wire carries a current into the page

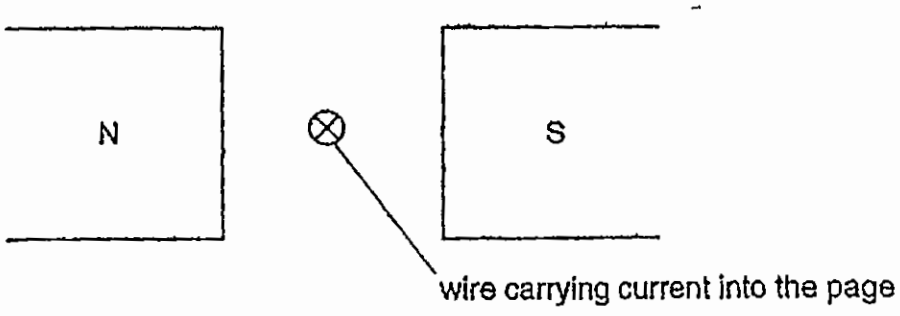


Fig 9 1

(i) State the direction of the magnetic field between the poles of the magnet [1]

_____

(ii) On Fig 9.1, draw an arrow to show the direction of the force acting on the wire [1]

(b) Fig 9 2 shows two wires Each wire carries a current into the page

Fig 9.2

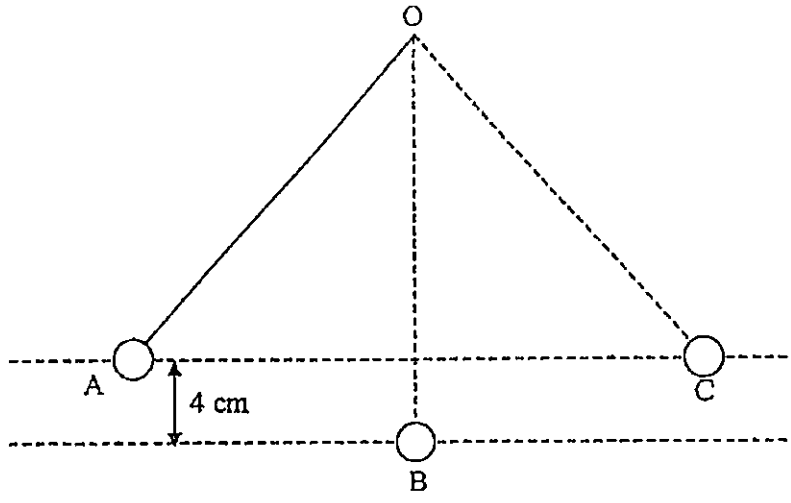
(i) On Fig 9 2, draw the magnetic field due to the currents in the wires [2]

(ii) There is a force on each wire due to the current in the other wire [1]
On Figure 9 2, draw an arrow on each wire to show these forces.

Section B (20 marks)

Answer any two questions in this section on the writing papers provided.

10 (a) A simple pendulum is made by hanging a metal ball of mass 250 g from a point O, as shown below



The highest positions reached by the pendulum bob are A and C, which are 4 cm above B At which position(s) A , B or C would the bob have

(i) maximum potential energy? [1]

(ii) maximum kinetic energy? [1]

(b) Calculate the gain in gravitational potential energy as the ball moves from B to C [2]

(c) Calculate the maximum speed of the pendulum bob [2]

(d) If the pendulum bob takes 0 4 s to move from A to B, what is the period of the pendulum? [1]

(e) An escalator is used to move 20 passengers every minute from the first floor of a department store to the second The second floor is located 5-meters above the first floor The average passenger's mass is 60 kg Determine the power requirement of the escalator in order to move this number of passengers in this amount of time [3]

11 Fig 11 shows an electrical circuit which comprises three resistors connected to a battery

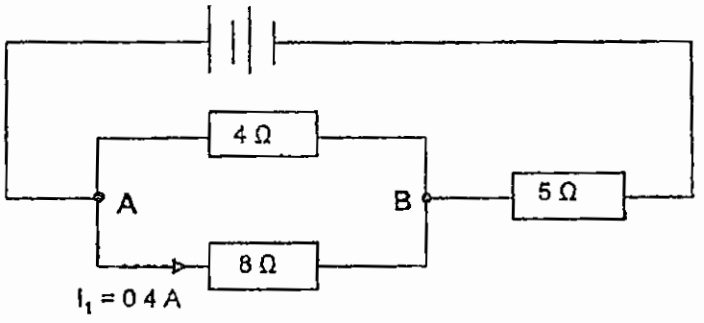


Fig 11

(a) Calculate the current through the 4 Ω resistor, given that I_1, the current through the 8 Ω resistor is 0 4 A [2]

(b) Calculate the e m f of the battery [3]

(c) Calculate the total resistance of the circuit [3]

(d) Would the addition of an extra resistor between A and B, in parallel with the 4Ω and 8Ω resistors, increase or decrease the current in the circuit? Explain your answer. [2]

12 (a) With the aid of a diagram, describe how an electric current could be used

(i) to magnetise a steel bar, [3]

(ii) to demagnetise a magnet. [4]

(b) State, explaining your answers, whether you would choose iron or steel for each of the following

(i) a bar magnet [1]

(ii) the core of an electromagnet [1]

(iii) the needle of a plotting compass [1]

Chung Cheng High Sch (Yishun)
Science (Physics)
Sec 4E5N Prelim Examination 2015

Marking scheme

P1.

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

P2

Section A.

1

(a) Acceleration = slope of $AB = \frac{12-0}{5-0}$ [1] = 2 4 m s^{-2} [1]

(b) Acceleration at t = 15 s,

= slope of CE

$= \frac{-12-12}{20-10}$ [1]

= –2 4 m s^{-2} [1]

(d) Total distance travelled

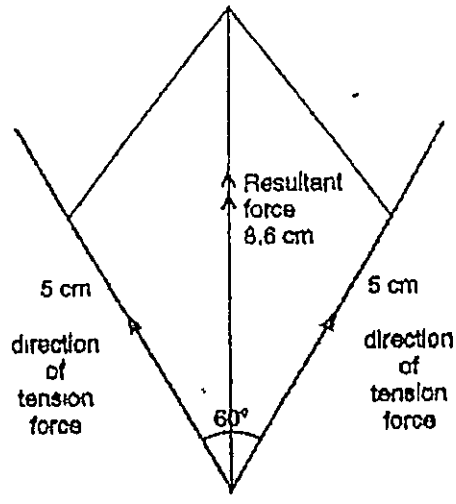
= Area of $ABCD$ + Area of $DEFG$

= ½ (15 + 5)(12) + ½ (12 5 + 2 5)(12) [1]

= 120 + 90

= 210 m [1]

2



Construction of parallelogram [1]
Resultant force = 34 4 N [1]
Direction of resultant force correctly indicated [1]

3 (a)

a $= \frac{F}{m}$

$= \frac{3500-2000}{1200}$ [1]

$= 1\ 25\ ms^{-2}$ [1]

(b) As speed increases so does the size of the drag force [1] Eventually the drag force becomes equal to the thrust [1] The resultant force is now equal to zero and therefore there is no further acceleration [1]

(c) The shape of the car is more streamlined [1], therefore the drag acting on the car is lower [1] It will take longer for the drag force on the car to be equal the thrust force, therefore the car can reach a higher top speed [1]

4 Sum of clockwise moments = sum of anticlockwise moments

120 N x (0 34 m) = F x (0 80 m) [1]

F = 51 N [1]

5 (a) infrared / IR [1]

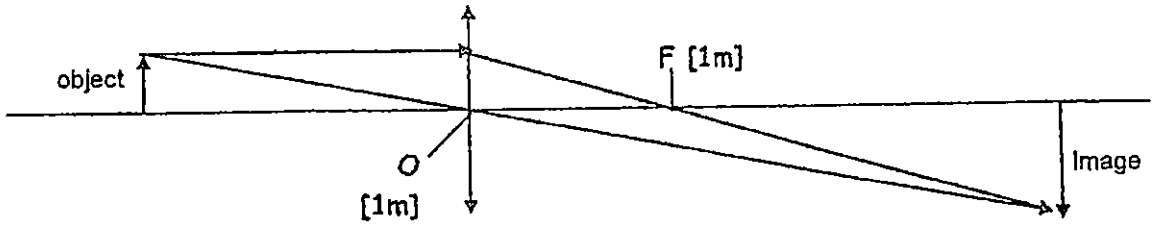
(b) • increase the power / watts
• decrease the speed
• put biscuits through again
(any 2, 1 m each))

Do not accept changes to oven design

(c) The inside surface is a good reflector or poor absorber of IR [1], while the outside surface is poor emitter of IR [1]. This increases the energy reaching the biscuits [1]

Do not accept. keeps the oven hotter (vague), no heat loss (not true)
Award only 1 m for makes the oven more efficient, reduce heat/energy loss

6 (a)



(b) projector [1m]

(c) The image will become smaller [1] OR The image will move to the left [1]

7 (a)	longitudinal wave	[1]
(b)	This is because the direction of vibration is parallel to the direction of the wave motion	[1]
(c)	For 1st echo, distance travelled = 2 x 99 = 198 m speed = dist / time = 198 / 0 6 = 330 m/s	[1] [1]
(d)	2 x (dist from far wall) = 330 x 0 8 total dist btw 2 walls = 99 m + (330 x 0 4) = 231 m	[1] [1]

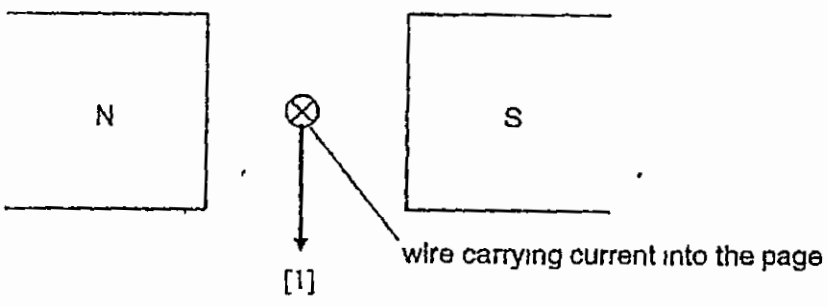
8 (a) current = power / voltage = 1680 / 240 [1]
= 7 A [1]

(b) 10 A fuse [1]

(c) (i) live wire - 7 A [1]
(ii) earth wire - 0 A [1]

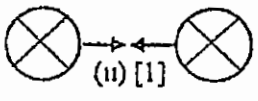
9 (a) (i) From N to S pole [1] OR from left to right [1]

(ii)



[1]

(b) (i) (To be hand drawn) [2]



(ii) [1]

Section B

10

(a) (i) Maximum potential energy A or C (Accept A and C) [1]

(ii) Maximum kinetic energy , B [1]

(b) Gain in gravitational potential energy = mgh
= 0 25 x 10 x 0 04 [1]
= 0 1 J [1]

4

(c) Maximum kinetic energy = Maximum gravitational potential energy

$$\frac{1}{2}mv^2 = 0\,1$$

$$\frac{1}{2}(0\,25)v^2 = 0\,1 \qquad [1]$$

$$v^2 = \frac{0\,2}{0\,25}$$

$$v = \sqrt{\frac{0,2}{0\,25}}$$

$$\approx 0\,894 \text{ m/s (to 3 s f)}$$

[1]

Maximum speed = 0 894 m/s

(d) Period = 0 4 x 4

= 1 6 s [1]

(e)

Force required to lift 20 people = 20 x 60 x 10 = 1200 N [1]

$P = \frac{W}{t}$

$= \frac{20\times60\times10\times5}{1\times60}$ [1]

= 20 W [1]

11

(a) p d across 8Ω resistor = 0 4 x 8 = 3 2 V [1]

Current through 4Ω resistor = $\frac{3\,2}{4} = 0\,8$ A [1]

(b) Current through 5Ω resistor = 0 4 + 0 8 A = 1 2 A [1]

P d across 5Ω resistor = 1 2 x 5 = 6 0 V [1]

Hence e m f of the battery = 3 2 + 6 0 = 9 2 V [1]

(c) Let effective resistance of parallel connection be R

$$\frac{1}{R} = \frac{1}{4} + \frac{1}{8}$$

$$\frac{1}{R} = \frac{2+1}{8} \qquad [1]$$

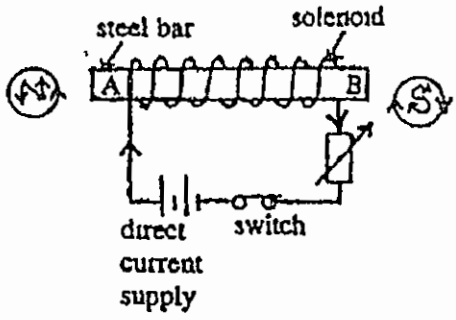
$$R = \frac{8}{3}\Omega = 2\,67\,\Omega \qquad [1]$$

Hence total resistance of the circuit = 2 67 + 5 = 7 67 Ω [1]

5

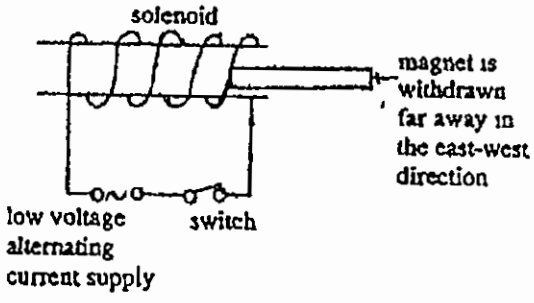
(d) Adding an extra resistor in parallel increases the current [1] in the battery as the effective resistance in the circuit is reduced [1]

12 (a) (i) A steel bar AB is placed in a solenoid [1] A direct current [1] flows through the solenoid when the switch is closed



1 m for correct diagram·
Bar is inside solenoid
DC supply
Accept if no rheostat and switch drawn

(ii) A magnet to be demagnetized is placed in a solenoid in the E-W direction [1] An alternating current [1] flows through the solenoid The magnet is withdrawn far away from the solenoid while the current still flow [1]



1 m for correct diagram.
Bar magnet in solenoid in E-W direction
AC supply
Accept if no switch drawn

(i) Steel It retains maghetism for a longer time. [1]

(ii) Soft iron It can be magnetized and lose magnetism easily [1]

(iii) Steel It retains magnetism for a long time. [1]