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COMMONWEALTH SECONDARY SCHOOL
PRELIMINARY EXAMINATION 2015

Science (Physics/Chemistry)
5076/1

PAPER 1

Name _____ () Class _____

Secondary Five Normal (Academic)

Monday
31 August 2015
1115 – 1215
1 hour

READ THESE INSTRUCTIONS FIRST

Write in soft pencil

Write your name, index number and class on the question booklet and any separate answer sheets used

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

Read very carefully the instructions on the OTAS.

There are **forty** multiple-choice questions in this booklet. Answer all questions

For each question, there are four possible answers, A, B, C and D. Choose the one you consider correct and shade your choice on the OTAS provided separately

Each correct answer will score one mark. A mark will not be deducted for a wrong answer

Take $g = 10 \text{ m s}^{-2}$ unless otherwise stated

Any rough working should be done in this booklet.

At the end of the examination, ensure that you have submitted all your work

A copy of the Data Sheet is printed on page 16

A copy of the Periodic Table is printed on page 17

Name of setter: Mr. Koh Tat Siang
Ms. Tian Yilin

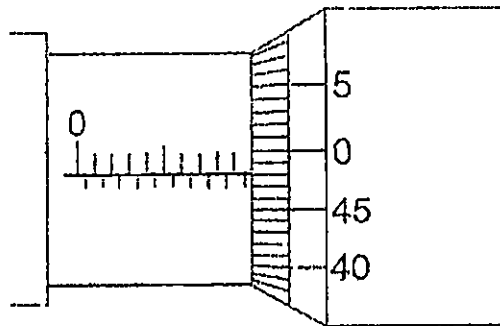
This paper consists of <17> printed pages

[Turn over

- 1 The period of a pendulum could be shortened by
- I Decreasing the mass of the pendulum bob
 - II Decreasing the length of the pendulum
 - III Decreasing the amplitude of its swing

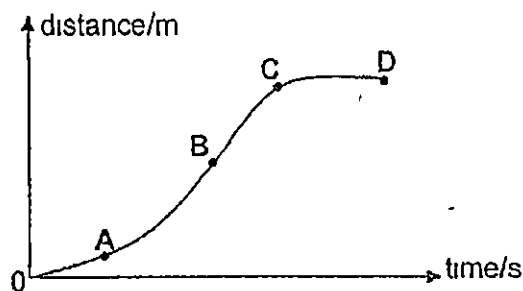
Which one of the following is correct?

- A Only II is correct
 - B Only III is correct
 - C Only I and II are correct
 - D Only II and III are correct
- 2 The diagram shows part of a micrometer screw gauge



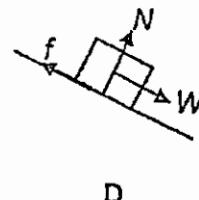
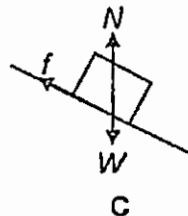
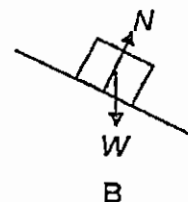
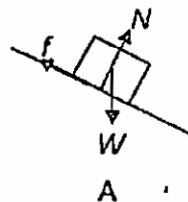
What is the reading shown?

- A 9.01 mm
 - B 9.02 mm
 - C 9.51 mm
 - D 9.98 mm
- 3 The following graph is the distance-time graph of a car that started from rest and has travelled for 10 s

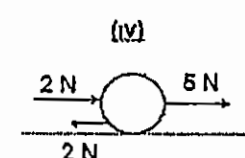
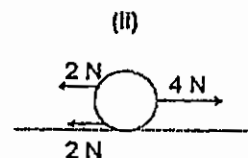
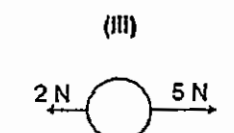
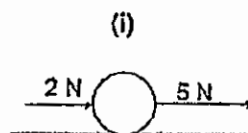


At which point of the graph is the speed of the car the greatest?

- 4 Under free-fall, both a book and a leaf would take the same time to fall through the same height in a vacuum. Which statement best explains the observation?
- A Both the book and the leaf are of the same mass
 B Both the book and the leaf are of the same volume
 C Both the book and the leaf fall at the same constant acceleration
 D Both the book and the leaf fall at the same constant speed
- 5 Which of the following represents the correct free-body diagram of a stationary object at rest on a rough slope?



- 6 The diagrams below show four similar objects with different forces acting on them

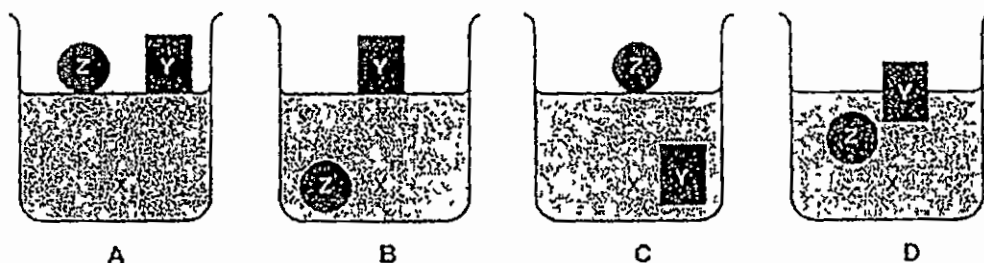


Which of the objects will travel at constant speed and which would have the greatest acceleration?

	Constant speed	Greatest acceleration
A	(ii)	(i)
B	(ii)	(iv)
C	(iv)	(i)
D	(iv)	(iii)

- 7 Liquid X has density of 900 kg/m^3 . A piece of solid Y of density 0.3 g/cm^3 and a large drop of an insoluble liquid Z of density 0.9 g/cm^3 were placed in liquid X.

Which of the following diagrams correctly shows what would be observed when the three substances are placed together?

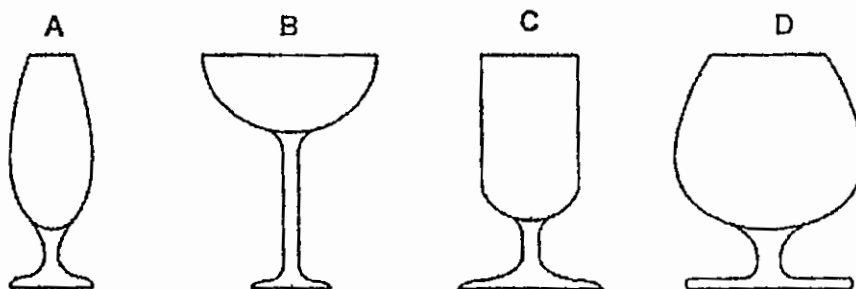


- 8 A pail on Earth is filled with sand and suspended using a long rope. The suspended pail is then given a push. This experiment is repeated on the Moon.

Which statement best explains the observation made?

- A A larger force is required to move the pail on Earth than on the Moon.
 B A larger force is required to move the pail on Moon than on the Earth.
 C The same amount of force is needed to move the pail in both cases.
 D The pail on Earth will be moved, but the pail on the Moon remains stationary.
- 9 The diagrams show the cross-sections of different glasses.

Which one is the least stable when filled with a liquid?



- 10 A liquid of the same volume as a solid expands faster when heated

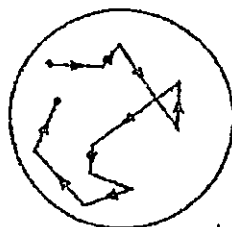
Which of the following statement is correct?

- A The liquid molecules are bigger
- B The liquid molecules expand faster
- C The forces between liquid molecules are weaker than those between the molecules in the solid
- D The liquid molecules collide more frequently with each other

- 11 Which factors increase the rate of evaporation of a liquid?

	Increasing its temperature	Increasing its surface area	Increasing its depth
A	yes	yes	yes
B	yes	yes	no
C	yes	no	yes
D	no	yes	yes

12. Smoke particles in a transparent box are observed using a microscope. A small point of light is seen to move around as shown

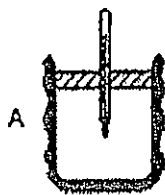


What does this experiment demonstrate about air molecules?

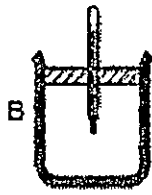
- A They are in continuous random motion
- B They can be seen through a microscope
- C They move more quickly when they are heated
- D They move because of collisions with smoke particles

- 13 Four metal cans are identical except for the colour and texture of their outer surfaces. The same amount of tap water is poured into each can

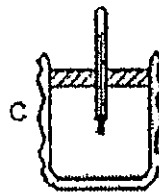
Which can will give the highest temperature reading after being put under the sun for a period of time?



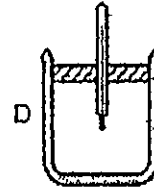
A
Black,
rough
surface



B
Black,
smooth
surface



C
White,
rough
surface



D
White,
smooth
surface

- 14 Radio waves, visible light and X-rays are all part of the electromagnetic spectrum. What is the correct order of decreasing wavelength?

	Longest wavelength → shortest wavelength		
A	Microwaves	Visible Light	X-rays
B	Microwaves	X-rays	Radio waves
C	X-rays	Radio waves	Visible light
D	X-rays	Visible light	Radio waves

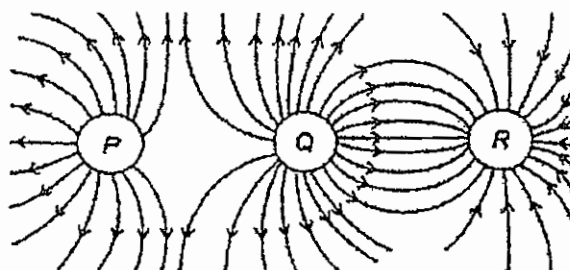
- 15 Two out of three different plastic rods were charged by rubbing. The following results were obtained when two of the rods are placed near each other

Rod X and Rod Y attracted
Rod X and Rod Z repelled

Which of the following show the charge of the rods?

	Rod X	Rod Y	Rod Z
A	negative	negative	negative
B	negative	neutral	positive
C	positive	neutral	positive
D	positive	negative	neutral

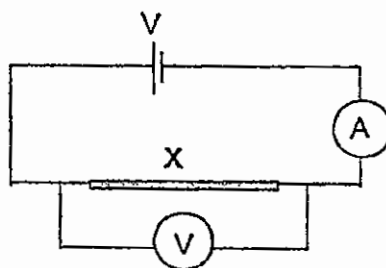
- 16 The figure below shows the pattern of electric field produced by three charged spheres



Which of the following correctly shows the charge on each sphere?

	P	Q	R
A	+	+	-
B	+	-	+
C	-	+	-
D	-	-	+

- 17 A resistor X with resistance R is made from a length L of resistance wire with a cross-sectional area A . It is connected to a simple electrical circuit and the voltmeter and the ammeter readings are recorded

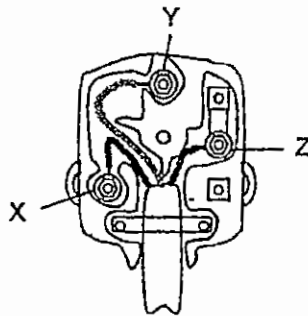


A second resistor Y made from wire of the same material has a length $2L$ and cross-sectional area A . Resistor X is removed and replaced by resistor Y in the electrical circuit

Which of the following correctly describes the readings observed from the voltmeter and ammeter?

	Voltmeter reading	Ammeter reading
A	decrease	decrease
B	decrease	increase
C	no change	decrease
D	no change	increase

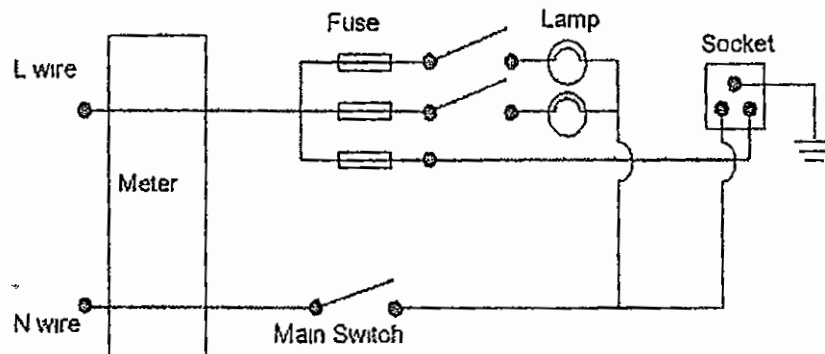
- 18 The diagram shows a three-pin plug used with a 12 A fuse



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

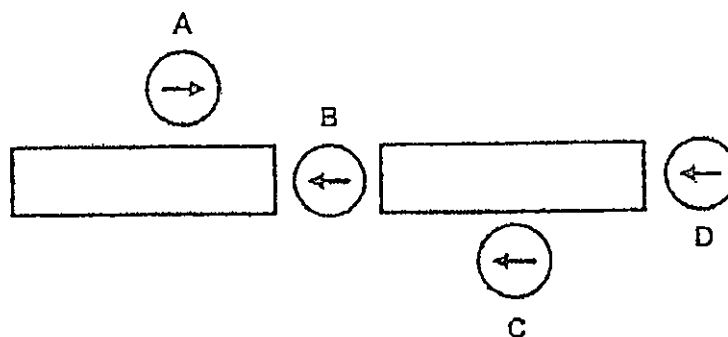
	Current of X / A	Current of Y / A	Current of Z / A
A	10	0	10
B	10	10	10
C	13	0	13
D	13	13	13

- 19 What is the mistake in the household circuit shown below?

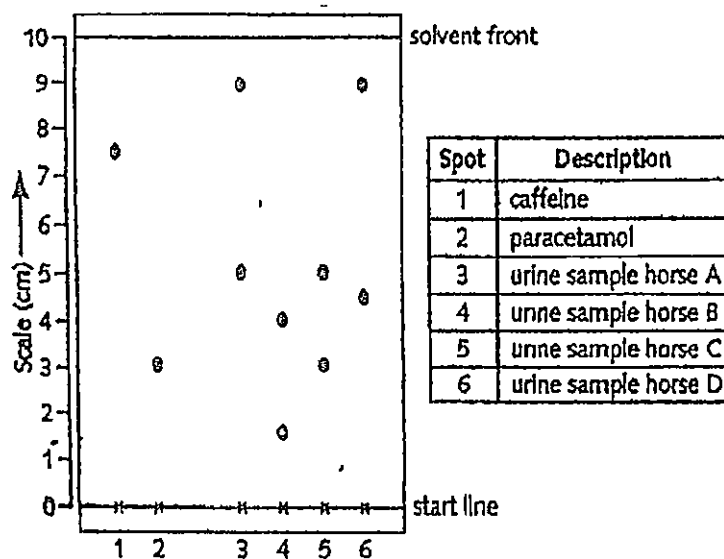


- A The main switch should be installed at the live wire
- B The position of the earth wire in the socket is wrong
- C There should be an earth wire connected to the bulbs
- D The neutral and the live wire in the socket should be interchanged.

- 20 Four plotting compasses are placed in the magnetic field of two bar magnets as shown in the diagram below. One of them is pointing in the wrong direction. Which one is it?



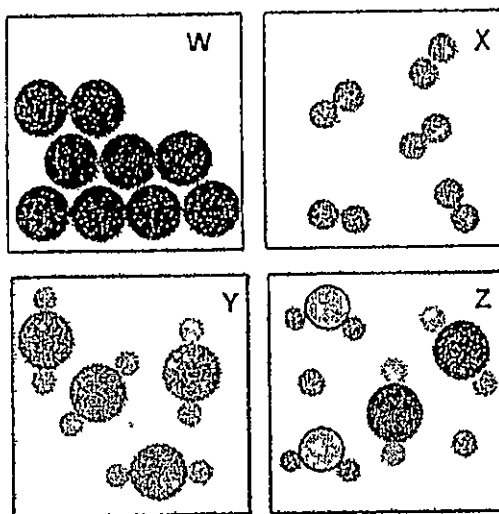
- 21 At horse races, caffeine and paracetamol are banned drugs. The following shows a chromatogram of the urine samples of four horses A to D



Which one of the following statement is true?

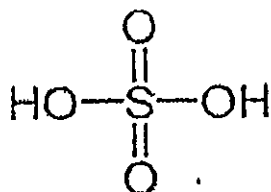
- A Horses A and C took the same banned drug
- B Horse B took both banned drugs
- C Horse C took paracetamol
- D Paracetamol is more soluble in the solvent compared to caffeine.

- 22 The particles in four substances W, X, Y and Z are shown below Which one of the following correctly describes the type of substance it is?



	W	X	Y	Z
A	element	element	compound	mixture
B	element	element	mixture	compound
C	element	compound	mixture	compound
D	compound	element	mixture	mixture

- 23 Sulfuric acid has the following structural formula,



How many valence electrons are found around the sulfur atom?

- A 2
B 6
C 8
D 12
- 24 Which of the following contains both ionic and covalent bonds?

- A H_2
B HCl
C NaCl
D NH_4Cl

- 25 Two particles U and V have the composition shown in the table below

particle	number of		
	electrons	protons	neutrons
U	10	8	8
V	18	17	18

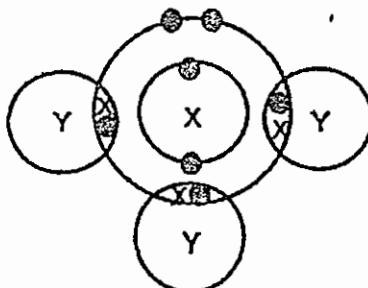
Which statement/s is/are correct?

- I Both particles U and V are negative ions
 II Particles U and V are isotopes
 III Particle V is heavier than particle U

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

- 26 The diagram shows the arrangement of electrons in a molecule of compound XY_3

x : electron of X
 o : electron of Y



What are the elements X and Y?

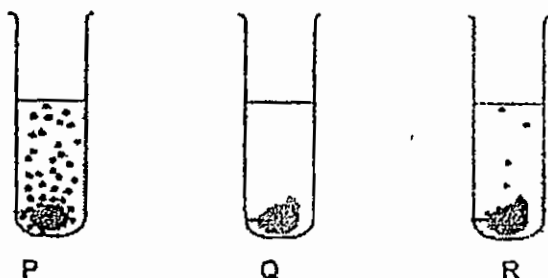
	X	Y
A	aluminium	chlorine
B	aluminium	hydrogen
C	nitrogen	chlorine
D	nitrogen	hydrogen

- 27 How many of the following substances can be added to hydrochloric acid to prepare silver chloride?

- silver metal
- silver nitrate solution
- silver sulfate solution
- silver oxide

- A 1
 B 2
 C 3
 D 4

- 28 Which pair of gases would change the colour of damp red litmus paper?
- A ammonia and chlorine
B chlorine and hydrogen
C carbon dioxide and oxygen
D carbon monoxide and sulfur dioxide
- 29 Which of the following contains the same number of moles as 16 g of oxygen gas?
- A 2 dm³ of hydrogen gas at r t p
B 12 dm³ of nitrogen gas at r t p
C 44 g of carbon dioxide, CO₂
D 100 g of calcium carbonate, CaCO₃
- 30 Which statement about Groups in the Periodic Table is correct?
- A All Groups contain both metallic and non-metallic atoms
B Atoms of elements in the same Group have the same total number of electrons
C In Group I, reactivity of the elements decreases with increasing proton (atomic) number
D In Group VII, the melting point of the elements increases with increasing proton (atomic) number
- 31 The diagrams show the reactions of different metals with dilute hydrochloric acid

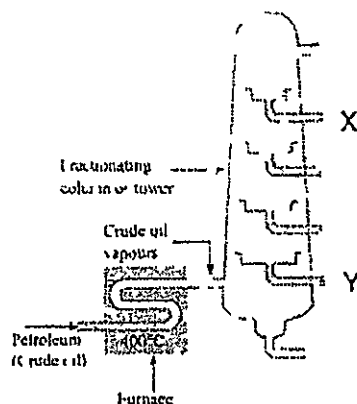


What are metals P, Q and R?

	P	Q	R
A	magnesium	zinc	copper
B	zinc	magnesium	copper
C	zinc	copper	magnesium
D	magnesium	copper	zinc

- 32 Haematite contains 90 % iron(III) oxide, Fe₂O₃. What is the maximum mass of iron that can be extracted from 1 kg of haematite?
- A 0.63 kg
B 0.70 kg
C 0.90 kg
D 1.56 kg

- 37 The diagram shows the separation of crude oil



Which of the following gives the correct information of fraction X and Y?

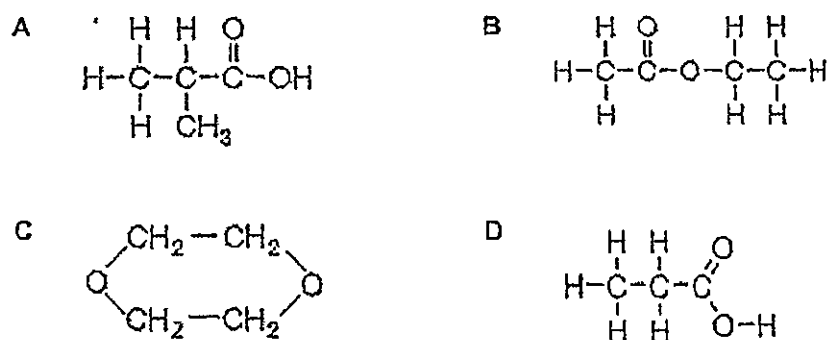
	boiling point of X	flammability of X
A	higher	lower
B	higher	higher
C	lower	higher
D	same	same

- 38 'Meta-fuel', $C_8H_{16}O_4$, is a fuel that is commonly used in camping stoves

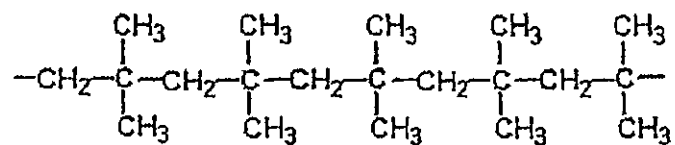
What is the equation for complete combustion of 'meta-fuel'?

- A $C_8H_{16}O_4 + 2O_2 \rightarrow 8C + 8H_2O$
 B $C_8H_{16}O_4 + 5O_2 \rightarrow 8CO + 8H_2O$
 C $C_8H_{16}O_4 + 10O_2 \rightarrow 8CO_2 + 8H_2O$
 D $C_8H_{16}O_4 + 8O_2 \rightarrow 4CO_2 + 4CO + 8H_2O$

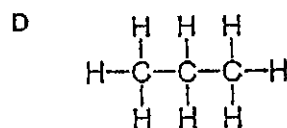
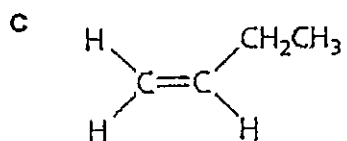
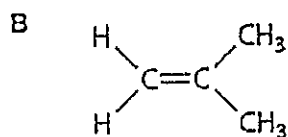
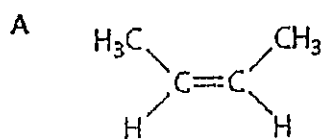
- 39 Which of the following is not an isomer of butanoic acid?



40 A polymer has the following structure



What is the possible monomer of this polymer?



- End of Paper 1 -

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

The Periodic Table of the Elements

Group																						
I	II											III	IV	V	VI	VII	0					
											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	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 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	210 Po Polonium 84	210 At Astatine 85	210 Rn Radon 86					
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 atomic mass X = atomic symbol b = proton (atomic) number																						
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	232 Pa Protactinium 91	238 U Uranium 92	Np Neptunium 93	Pu Plutonium 94	Am Americium 95	Cm Curium 96	Bk Berkelium 97	Cf Californium 98	Es Einsteinium 99	Fm Fermium 100	Md Mendelevium 101	No Nobelium 102	Lr Lawrencium 103									

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



COMMONWEALTH SECONDARY SCHOOL
PRELIMINARY EXAMINATION 2015

Science (Physics)
(5076/2)

PAPER 2

Name _____ () Class _____

Secondary Five Normal (Academic)

Wednesday
26 August 2015
0800-0915
1 hour 15 minutes

READ THESE INSTRUCTIONS FIRST

Write your name, index number and class on the question booklet and any separate answer sheets used.
Write in dark blue or black pen. You may use a soft pencil for any diagrams or graphs.
Do not use staples, paper clips, highlighters, glue or correction fluid.

Section A (45 Marks)

Answer all questions.

Write your answers in the spaces provided on the question paper.

Section B (20 Marks)

Answer any two questions.

Write your answers in the spaces provided on the question paper.

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

Take $g = 10 \text{ m s}^{-2}$ unless otherwise stated.

Candidates are reminded that all quantitative units should include appropriate units.

Candidates are advised to show all their working in a clear and orderly manner, as more marks are awarded for the sound use of physics than correct values.

At the end of the examination, ensure that you have submitted all your work.

For Examiner's Use		
Paper 2	Section A	/ 45
Paper 2	Section B	/ 10
		/ 10
		/ 10
Total		/ 65

Name of setter: Mr. Koh Tat Siang

This paper consists of <16> printed pages

[Turn over

Section A (45 Marks)

Answer all questions

Write your answers in the spaces provided on the question paper

- 1 Fig. 1.1 below shows a stone supported by two strings that hang from a rod

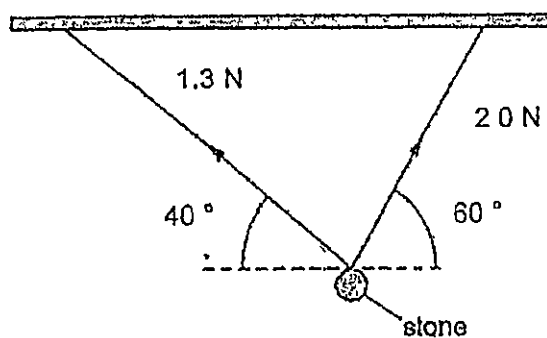


Fig. 1.1

The tensions in the two strings are 1.3 N and 2.0 N

In the space below, draw a labelled diagram to show the resultant of the two tensions. Determine the size of the resultant force and the angle between the resultant force and the horizontal. [5]

Scale _____

Resultant force = _____

Angle = _____

- 2 Fig. 2.1 (not drawn to scale) shows an incident ray at point P on the surface of a right angled glass prism

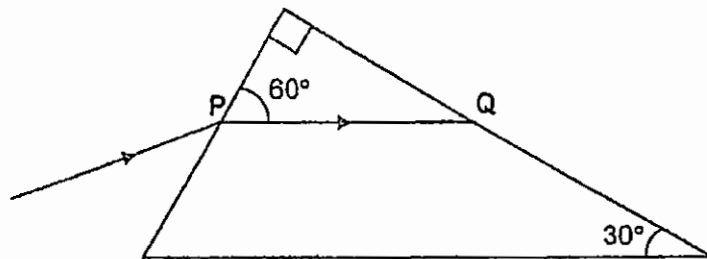


Fig. 2.1

- (a) The refractive index of the glass prism is 1.53. Determine the angle of incidence at point P.

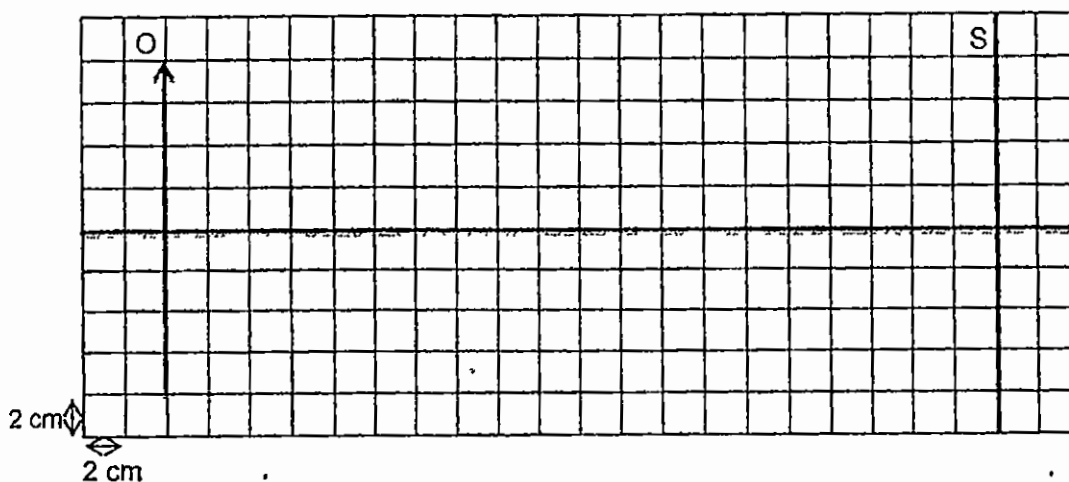
angle of incidence = _____ [2]

- (b) Determine the critical angle of glass.

Critical angle = _____ [2]

- (c) On Fig. 2.1, complete the path of the light after it reaches point Q. Ensure all angles are properly labelled. [1]

- 3 An object, O, of 16 cm in length, is placed in front of a screen, S. A thin converging lens is placed between the object and screen and its position is adjusted until a sharp image of the object is formed on the screen. The image is half the size of the object.



- (a) On 2 cm by 2 cm, grid above, draw a ray diagram to determine the position of the lens and its focal point. Label the lens L and the focal point F. [3]
- (b) If the bottom half of the lens is covered by a piece of black paper, state and explain any change(s) if any, to the image formed on the screen. [2]

- 4 Fig. 4.1 shows the speed-time graph of a car. The mass of the car is 1200 kg.

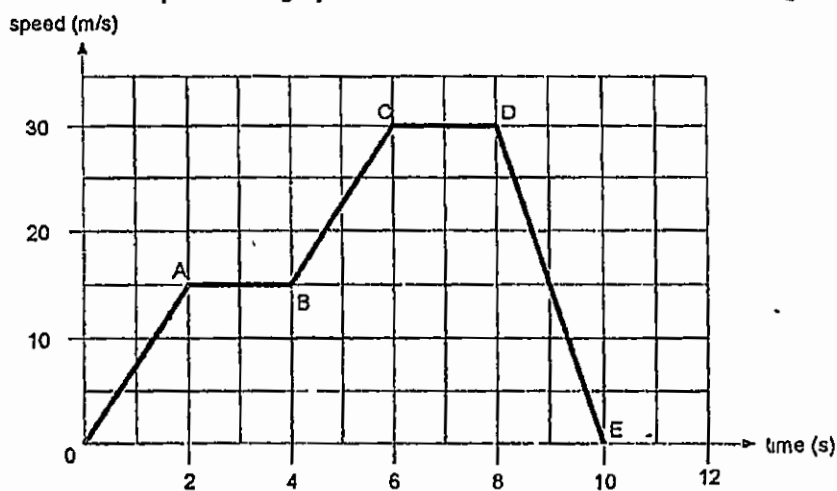


Fig. 4.1

- (a) Describe the motion of the object from D to E [1]

- (b) Calculate the acceleration of car from B to C

Acceleration = _____ [2]

- (c) Determine the resultant force acting on the car from B to C

Resultant force = _____ [2]

- (d) Determine the average speed from $t = 0 \text{ s}$ to $t = 10 \text{ s}$

Average speed = _____ [3]

- 5 Fig 5.1 shows a 50 W motor driving piston A in an enclosed tank filled with oil

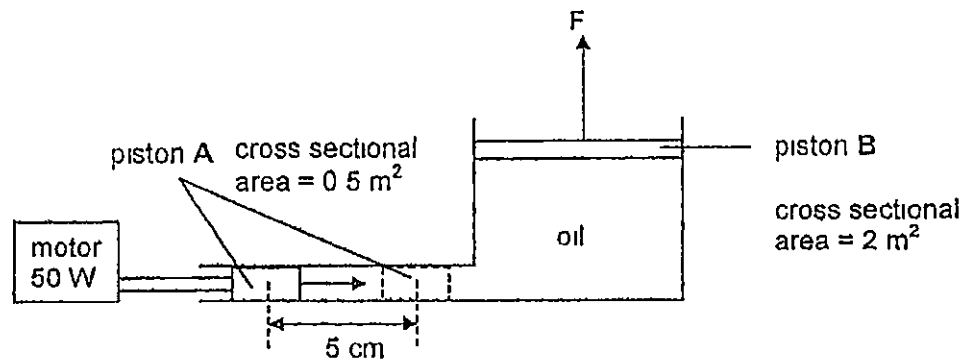


Fig 5.1

In a time of 2.0 s, the motor drives the piston 5 cm in the direction shown in Fig. 5.1

- (a) Calculate the work done by the motor in driving the piston

Work done = _____ [1]

- (b) Calculate the driving force exerted by the motor

Force = _____ [2]

- (c) Calculate the force, F , experienced by piston B

Force, F = _____ [2]

- (d) Without making changes to the motor, suggest and explain how the force F can be increased [2]

- 6 Fig. 6.1 shows a toy car of mass 1.00 kg on a smooth track. The toy car which is given a slight push starts to move with an initial speed of 2.00 m/s down a smooth track.

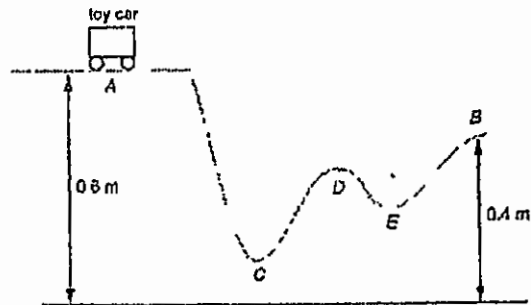


Fig. 6.1

- (a) State the *Law of Conservation of Energy*. [1]

- (b) State and explain at which point on the track would the speed of the toy car be at its maximum. [2]

- (c) Determine the speed of the toy car at B

Speed = _____ [3]

- 7 A small amount of substance Z was heated up from a temperature of $-20\text{ }^{\circ}\text{C}$ using a 500 W heater. Fig. 7.1 below shows how the temperature of the substance varies with time.

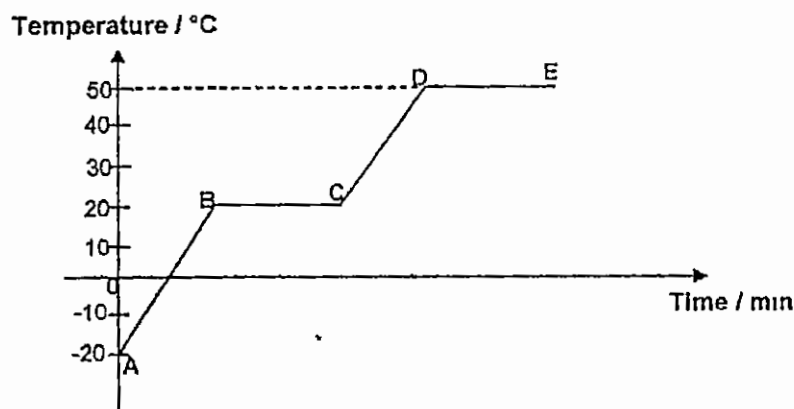


Fig. 7.1

- (a) What is the melting point of the substance? [1]
- _____
- (b) Explain why there is no increase in temperature between points B and C even though heat is supplied constantly [1]
- _____
- _____
- _____
- (c) If the 500 W heater in the experiment is replaced by a 900 W heater, would the temperature for which D and E occur change? Explain your answer [2]
- _____
- _____
- _____

- 8 Fig 8.1 shows two steel rods being placed in a coil connected to a d.c. supply

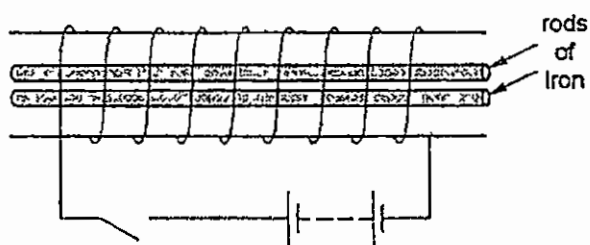


Fig. 8.1

When the switch is closed, the two rods moved away from each other. Explain why this happens [2]

- 9 Fig. 9.1 shows the circuit used to investigate the force on a wire carrying a current in a magnetic field

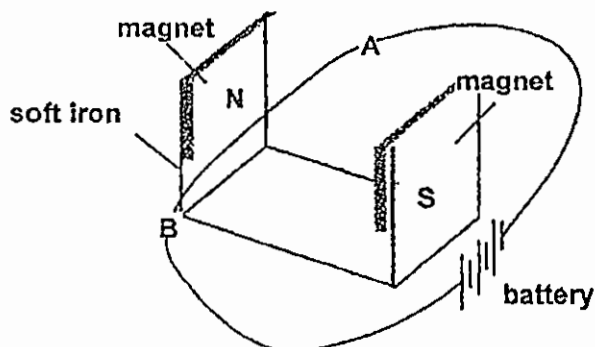


Fig 9.1

- (a) Draw on Fig. 9.1 the direction of the force on the section AB of the wire [1]
- (b) State and explain the effect of the direction of force on the section AB if the battery was changed into an A.C. supply [2]

Section B (20 Marks)
Answer any 2 questions

- 10 Fig 10.1 shows a box of uniform density about to be turned about the point P by a force. The weight of the box is 50 N

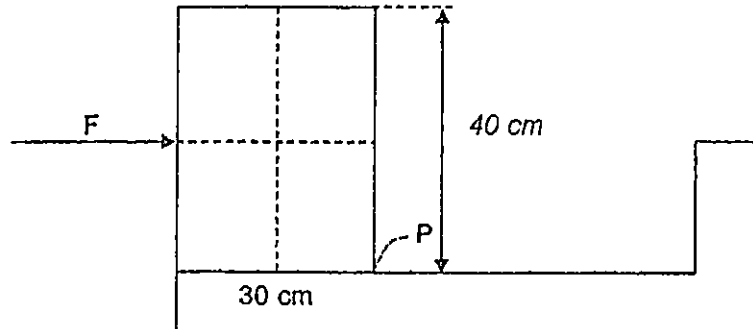


Fig 10.1

- (a) On Fig. 10.1,
- draw a cross and label it 'cg' to indicate where the centre of gravity of the box is [1]
 - draw an arrow and label it '50 N' to indicate where the weight of the box is acting [1]
- (b) Define the *principle of moments* [1]
- _____
- _____
- _____
- (c) (i) State whether F is creating a clockwise or anticlockwise moment about P [1]
- _____
- _____
- (ii) Calculate the moment due to the weight of the box about P

moment due to the weight = _____ [2]

(iii) Hence or otherwise, determine the unknown Force F

moment due to the weight = _____ [2]

(d) Without altering the box or using more forces, explain what can be done to reduce the force F required to just turn the box. [2]

(iv) the current passing through the $20.0\ \Omega$ resistor

current = _____ [2]

(b) Switch S_3 is now closed. Describe if any, the changes on the ammeter reading. [2]
Explain your answer

- 11 Fig 11.1 shows an electric circuit that contains three resistors. Three switches S_1 , S_2 and S_3 are opened.

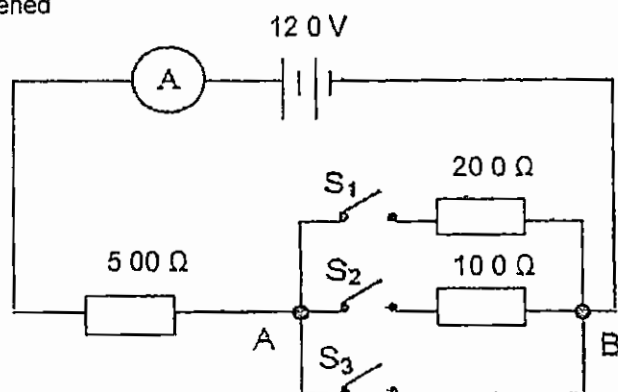


Fig 11.1

- (a) When switch S_1 and S_2 are closed, determine

- (i) the effective resistance of the circuit,

effective resistance = _____ [2]

- (ii) the current shown in the ammeter,

current = _____ [2]

- (iii) the potential difference across the $5.00\ \Omega$ resistor.

potential difference = _____ [2]

(iv) the current passing through the $20.0\ \Omega$ resistor

current = _____ [2]

(b) Switch S_3 is now closed. Describe if any, the changes on the ammeter reading. [2]
Explain your answer

- 12 (a) Fig 12.1 shows a particle A in a medium. The arrows below indicate the direction of travel of a wave passing through the medium and the direction of vibration of particle A.

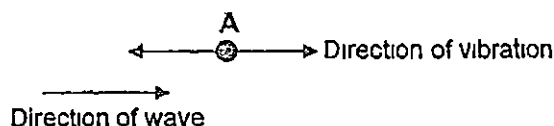


Fig. 12.1

State and explain whether the wave is a transverse or longitudinal wave

[1]

- (b) Fig. 12.2 shows a graph of the variation in the vertical displacement s of the ripple tank vibrator with distance d travelled by the wave.

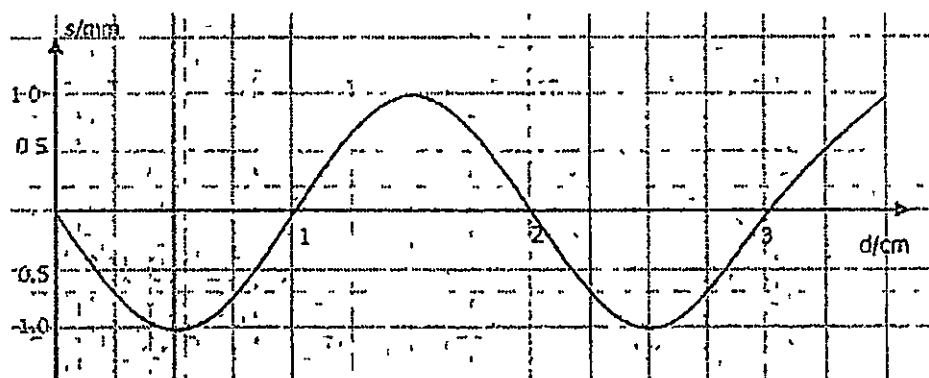


Fig. 12.2

Fig. 12.3 below shows a graph of the variation the vertical displacement s of the ripple tank vibrator with time t travelled by the wave.

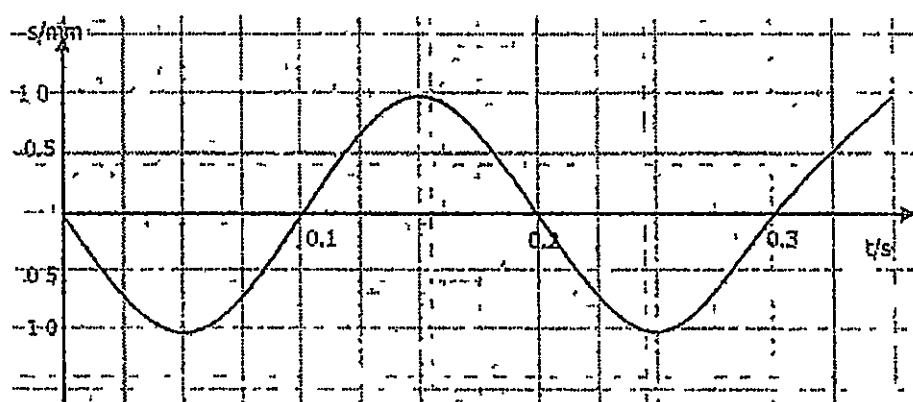


Fig. 12.3

15

- (i) State the amplitude of the wave

amplitude = _____ [1]

- (ii) Determine the frequency of the wave

frequency = _____ [2]

- (iii) Determine the speed of the wave

speed = _____ [2]

- (c) Fig. 12.4 shows a device that is used to measure the depth of the sea beneath a ship. Sound waves are given out by the transmitter. When sound waves hit an object, some of the sound is reflected back to the receiver. The time taken is used to measure the distance to the bottom of the sea.

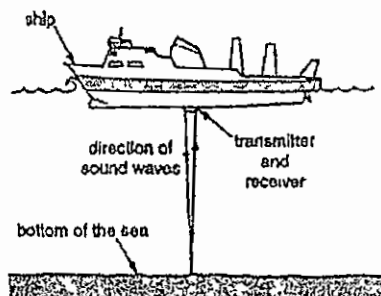


Fig. 12.4

The speed of sound in water is 1500 m/s. The time between the sound being transmitted to the bottom of the sea and being detected by the receiver is 1.6 s. Calculate the distance between the ship and the bottom of the sea.

distance = _____ [2]

- (d) Fig. 12.5 shows how air pressure varies with time for a sound produced by the guitar.

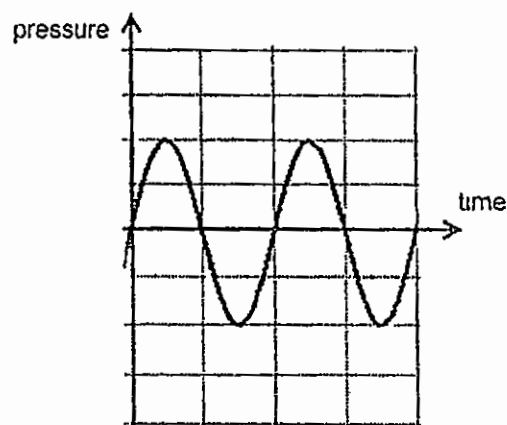


Fig. 12.5

Draw the variation of pressure with time on Fig. 12.5 for a sound which is louder and higher in pitch. [2]

--End of Paper 2--

2015 Prelim 5N Physics Answers

Paper 1

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

All quantitative answers are to be to 2 or 3 s.f. and with units to a maximum deduction of 1 mark per question part

Q/NO	ANSWER	MARKS
1	Scale = 1 cm 0.333 N or smaller Angles between 2.0 N force and 1.3 N force correct Method correct with resultant force drawn correctly Resultant force = 2.57 N (2.40 N to 2.80 N) accept 2 s.f. Angle = 90° ($\pm 1^\circ$) *missing arrows = -1 mark	1 1 1 1 1
	Sub-Total	5
	Marker's feedback	

Q/NO	ANSWER	MARKS
2 (a)	$\frac{\sin i}{\sin r} = 1.53$ $\frac{\sin i}{\sin 30} = 1.53$ $i = 50.0^\circ$	1 1
(b)	$\sin c = 1/1.53$ $n = 40.8$	1 1
(c)	<i>TIR occurs at Q Angle I = angle R = 30°</i>	1
	Sub-Total	5
	Marker's Feedback	

Q/NO	ANSWER	MARKS
3 (a)	<i>Image on the screen, 8 cm in total centered on the principal axis</i> <i>Lens located where one ray 1 cuts principal axis</i> <i>F located where one ray 2 cuts principal axis</i>	1 1 1
(b)	The image would be less bright as less light from the object now reaches the image.	1 1
	Sub-Total	5
	Marker's Feedback	

Q/NO	ANSWER	MARKS
4 (a)	D to E The object's speed is decreasing with a constant acceleration/ constant rate Or Constant negative acceleration	1
(b)	Acceleration = $(30 - 15) / 2$ = 7.50 ms^{-2}	1 1
(c)	Resultant force = ma = $1200(7.5)$ = 9000 N <i>E c f</i>	1 1
(d)	Total distance = 180 m Average speed = $180/10$ = 18 m/s	1 1 1
	Sub-Total	8
	Marker's Feedback	

Q/NO	ANSWER	MARKS
5 (a)	WD = $P \times t$ = 50×2 = 100 J	1
(b)	WD = $F \times d$ $100 = F \times 0.05$ $F = 2000 \text{ N}$	1 1
(c)	$F/0.5 = F/2$ $F = (2000/0.5) \times 2$ = 8000 N	1 1
(d)	A tank with a larger piston B can be used. Or A tank with a smaller piston A can be used	1

	This would increase the ratio of the surface area of piston A to surface area of piston B	1
	Sub-Total	6
	Marker's Feedback	

Q/NO	ANSWER	MARKS																				
6 (a)	Energy cannot be created nor destroyed. It can only be converted from one form to another; the total energy of an isolated system is constant	1																				
(b)	C, at this point the change in height of the toy car is the greatest and the largest amount of GPE would have been converted to KE and thus the car would be at the greatest speed	1 1																				
(c)	<table border="1"> <thead> <tr> <th></th><th>A /J</th><th>B /J</th><th></th></tr> </thead> <tbody> <tr> <td>KE</td><td>$\frac{1}{2} (1)(2)^2$ = 2.0</td><td>4.0</td><td>KE</td></tr> <tr> <td>GPE</td><td>$1(10)(0.6)$ = 6.0</td><td>$1(10)(0.4)$ = 4.0</td><td>GPE</td></tr> <tr> <td>Work done on</td><td>0</td><td>0</td><td>Work done by</td></tr> <tr> <td>Total</td><td>8.0</td><td>8.0</td><td>Total</td></tr> </tbody> </table> Or Loss in GPE = $1(10)(0.6 - 0.4) = 2.0 \text{ J}$ Total KE = Initial KE + loss in GPE = 4.0 J $\frac{1}{2} (1)V^2 = 4.0 \text{ J}$ $V = 2.83 \text{ ms}^{-1}$		A /J	B /J		KE	$\frac{1}{2} (1)(2)^2$ = 2.0	4.0	KE	GPE	$1(10)(0.6)$ = 6.0	$1(10)(0.4)$ = 4.0	GPE	Work done on	0	0	Work done by	Total	8.0	8.0	Total	1 1 1
	A /J	B /J																				
KE	$\frac{1}{2} (1)(2)^2$ = 2.0	4.0	KE																			
GPE	$1(10)(0.6)$ = 6.0	$1(10)(0.4)$ = 4.0	GPE																			
Work done on	0	0	Work done by																			
Total	8.0	8.0	Total																			
	Sub-Total	6																				
	Marker's Feedback																					

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Q/NO	ANSWER	MARKS
7(a)	20 °C	1
7(b)	The energy supplied is used to overcome the intermolecular forces of attraction to change state.	1
(c)	No The heater will not change the boiling point of a substance	1 1
	Sub-Total	4
	Marker's Feedback	

Q/NO	ANSWER	MARKS
8	The current flowing in the coil will magnetize the iron rods such that they have the same polarity at the same side	1
	As like poles repel, the rods would repel	1
	Marker's Feedback	
	Sub-Total	2

Q/NO	ANSWER	MARKS
9 (a)	Downwards	1
(b)	As the current flows now alternates between from A to B and from B to A, The force will alternate between downwards and upwards	1 1
	Sub-Total	3
	Marker's Feedback	

Answers to Section B

Q/NO	ANSWER	MARKS
10(a)(i)	<i>Cg at the centre of box</i>	1
(a)(ii)	<i>Weight acting from cg, downwards</i>	1
(b)	When an object is in equilibrium, the sum of clockwise moments is equal to the sum of anti-clockwise moment about the same pivot	1
(c)(i)	Clockwise	1
(c)(ii)	Moment = 50×0.15 = 7.50 Nm	1 1
(c)(iii)	$F \times 0.20 = 7.50 \text{ Nm}$ $F = 37.5 \text{ N}$ e c f	1 1
(d)	The force, F can be applied at the top of the box. This will increase the perpendicular distance to the pivot and this require less force to produce 7.50 Nm of clockwise moment	1 1
	Sub-Total	10
	Marker Feedback	

Q/NO	ANSWER	MARKS
11 (a)(i)	$R = 5 + \left(\frac{1}{10} + \frac{1}{20}\right)^{-1}$ $= 11.7 \Omega$	1 1
(a)(ii)	$I = 12/11.7$ $= 1.03 \text{ A}$ E c f	1 1
(a)(iii)	$V = 1.03 \times 5$ $= 5.15 \text{ V}$ E c f	1 1
(a)(iv)	$I = 1.03 \times 10/30$ $= 0.343 \text{ A}$ Or $I = \frac{12 - 5.15}{20}$ $= 0.343 \text{ A}$ E c f	1 1
(b)	A short circuit would occur and the effective resistance of the circuit would become 5.00Ω As such the current would increase as the resistance has dropped	1 1
	Sub-Total	10
	Marker Feedback	

Q/NO	ANSWER	MARKS
12 (a)	Transverse, the particle is vibrating parallel to the direction of travel of the wave	1
(b)(i)	1.0 mm	1
(b)(ii)	$f = 1/0.2$ $= 5.00 \text{ Hz}$	1 1
(b)(iii)	Speed = $5(0.02)$ $= 0.100 \text{ m/s}$ E c f	1 1
(c)	Distance = $(1500 \times 1.6)/2$ $= 1200 \text{ m}$	1 1
(d)	<i>Higher amplitude</i> <i>Shorter period</i>	1 1
Sub-Total		10
	Marker Feedback	