中正中学 义顺
CHUNG CHENG HIGH SCHOOL YISHUN

Preliminary Examination 2018
Secondary 4 Express / 5 Normal Academic

Candidate			
	Name	Register No	Class

Science Physics
Paper 1
5076, 5077

Date: 24 Aug 2018
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

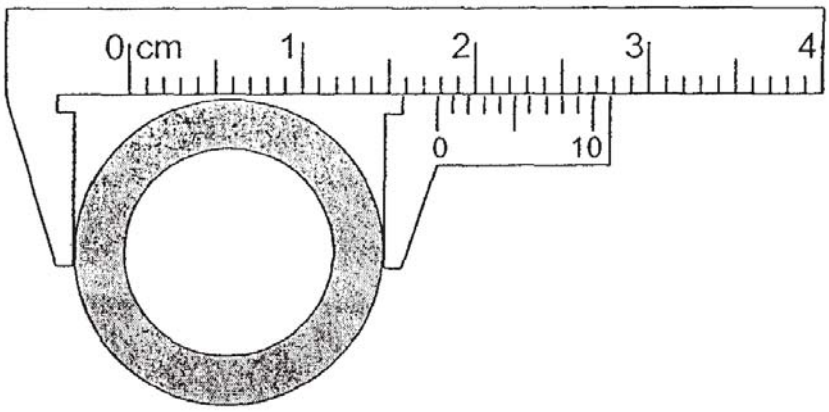
Setter: Mr Thong Nai Kee

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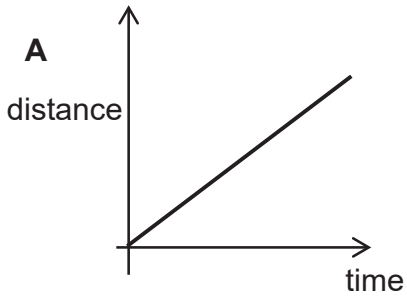
1. The diagram below shows a pair of vernier calipers set to measure a metal pipe. Given that the pipe has an internal diameter of 1.02 cm, what is the thickness of the wall of the metal pipe?



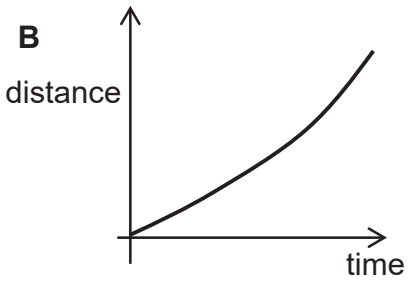
A 0.28 cm
B 0.38 cm
C 0.56 cm
D 0.76 cm

2. Which of the following distance-time graph best represents that of a rock, which is dropped from a tall building? Assume that air resistance is negligible

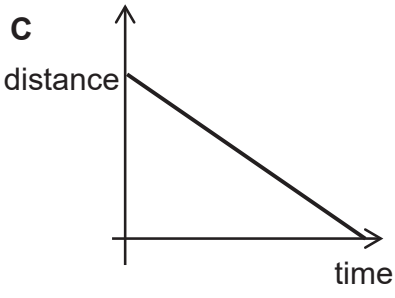
A



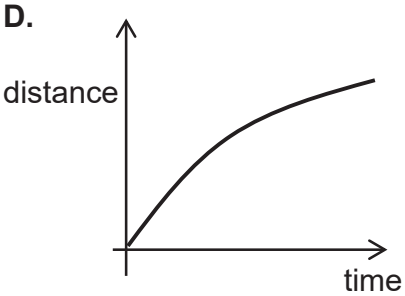
B



C



D.



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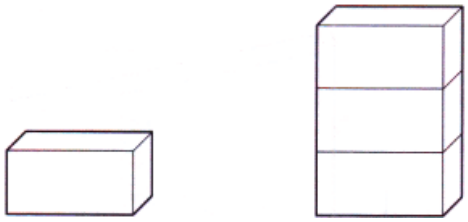
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3. An object is moving to the right in a straight line with a constant speed.
Which of the following statements is true ?

A There are no forces acting on the object.
B There is a larger number of forces acting on the object to the right than to the left.
C There is only one force acting on the object and it is acting to the right.
D The resultant force acting on the object is zero.

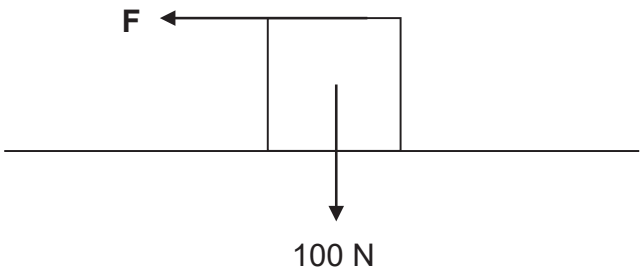
4. The diagram below shows a single brick and a pile of three bricks.
ALL the bricks are identical.

Which of the following statements is **true**?



A The pile of bricks has the same density but three times the volume and mass of the single brick.
B The pile of bricks has the same mass but three times the density and volume of the single brick.
C The pile of bricks has the same volume but three times the density and mass of the single brick.
D The pile of bricks has three times the mass, volume and density of the single brick

5. The diagram shows a uniform cube of weight 100 N on a rough surface.



What is the horizontal force **F** needed to just lift the cube?
A 50 N
B 100 N
C 200 N
D F depends on the friction between the cube and the rough surface.

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6. A girl of weight 450 N runs up a flight of 20 steps in 10.0 s. Each step has a height of 10 cm.
What is the average power developed by the girl ?

A 22.5 W
B 90 W
C 225 W
D 900 W

7. A girl of weight 450 N runs up a flight of 20 steps in 10.0 s. Each step has a height of 10 cm.
What is the average power developed by the girl ?

A 22.5 W
B 90 W
C 225 W
D 900 W

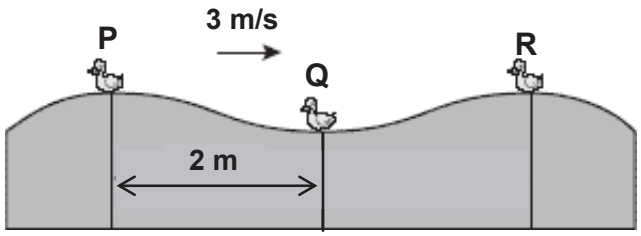
8. A cube of ice is heated to water, then to steam. Which of the following is true?

A The molecules expand as ice changes to steam.
B The molecules move closer to one another as ice changes to steam.
C The molecules move slower as ice changes to steam.
D The forces of attraction between molecules decreases as ice changes to steam.

9. A piece of aluminium foil is shiny on one side and dull on the opposite side. When it is used to wrap around food to be cooked in a barbecue fire, which side of the foil should face the fire and why?

	Side facing the fire	Reason
A	dull	better absorber of heat
B	dull	better conductor of heat
C	shiny	better reflector of heat
D	shiny	better conductor of heat

10. The diagram below shows three toy ducks floating on water, moving up and down as a wave travels to the right with a velocity of 3 m/s. The distance between **P** and **Q** is 2 m.



Which of the following is the frequency of the wave?

A 0.75 Hz
B 1.33 Hz
C 1.5 Hz
D 6.0 Hz

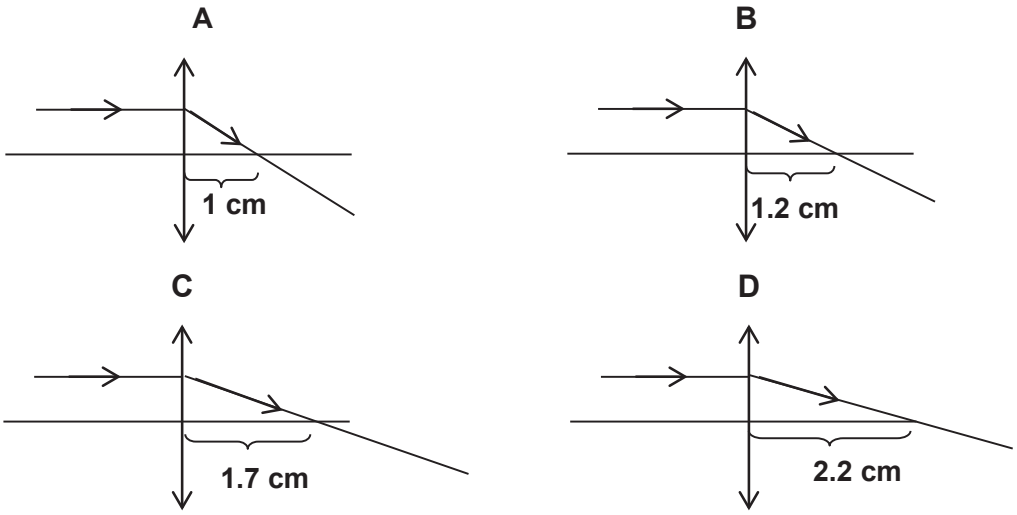
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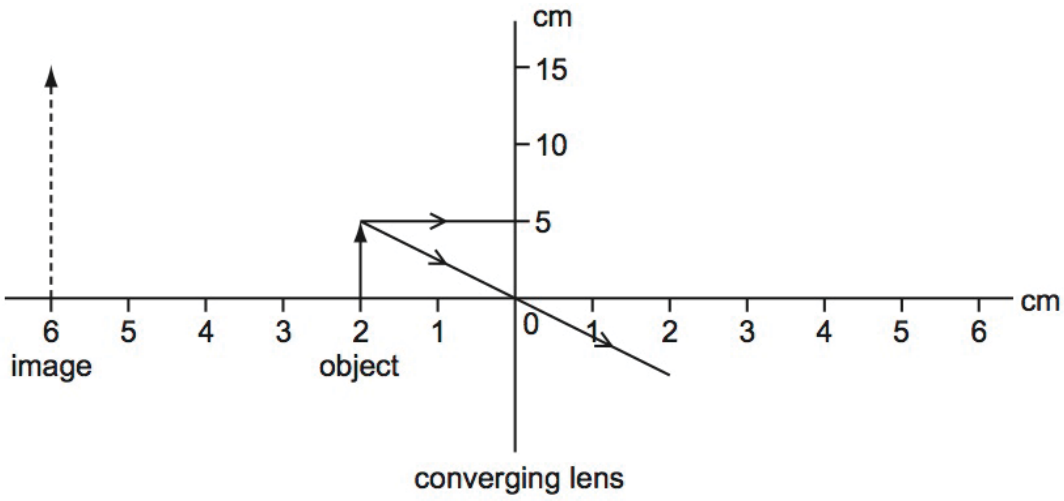
11. Which of the following is always **true** about wave motion?

A The particles always move perpendicular to the wave.
B The particles always move parallel to the wave.
C The particles always move along with the wave.
D Energy is transmitted as the wave moves.

12. Which of the following thin converging lens has the highest refractive index?



13. An object 5.0 cm high is placed 2.0 cm from a converging (convex) lens which is being used as a magnifying glass
The image produced is 6.0 cm from the lens and is 15 cm high.



What is the focal length of the lens?

A 2.0 cm
B 3.0 cm
C 4.0 cm
D 6.0 cm

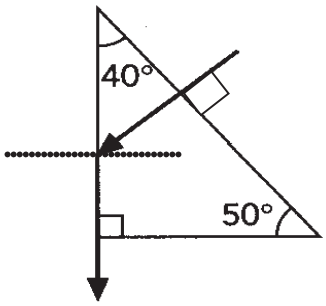
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14. Which of the following system is **not** an application of electromagnetic waves?

A Sonar system
B Radar system
C Infra-red system for night navigation
D Wire-less telecommunication system

15. A ray of light enters a glass prism and travels along the path as shown in the figure below.



What is the refractive index of the glass?

A 1.40
B 1.46
C 1.50
D 1.56

16. X and Y are lamps with filaments made from the same material. The filament of lamp X is thicker and shorter than that of lamp Y.

When X and Y are connected to the mains and switched on, which is the brighter lamp and which lamp has the larger resistance?

	brighter lamp	larger resistance
A	X	X
B	X	Y
C	Y	X
D	Y	Y

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17. **Diagram 1** shows a resistor connected to a battery, an ammeter and a voltmeter. The ammeter reading is 0.5A and the voltmeter reading is 3.0 V
A second identical resistor is now connected in parallel with the first resistor, as shown in **diagram 2.**

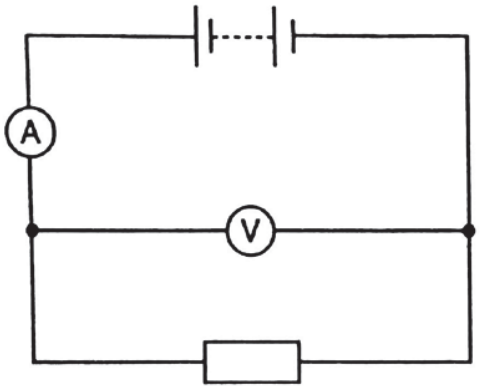


diagram 1

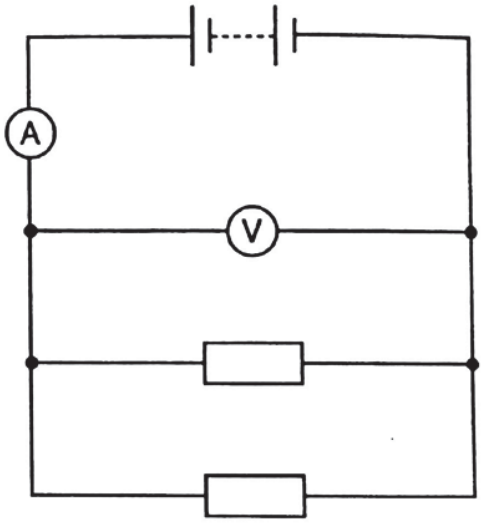
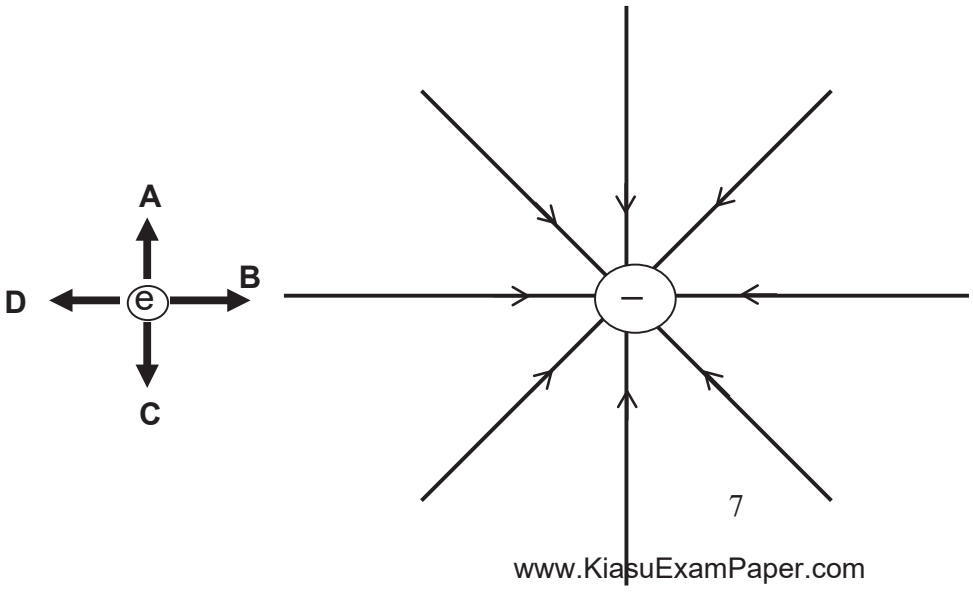


diagram 2

What are the ammeter and voltmeter readings in the circuit shown in diagram 2?

	ammeter reading / A	voltmeter reading / V
A	0.5	3.0
B	0.5	6.0
C	1.0	1.5
D	1.0	3.0

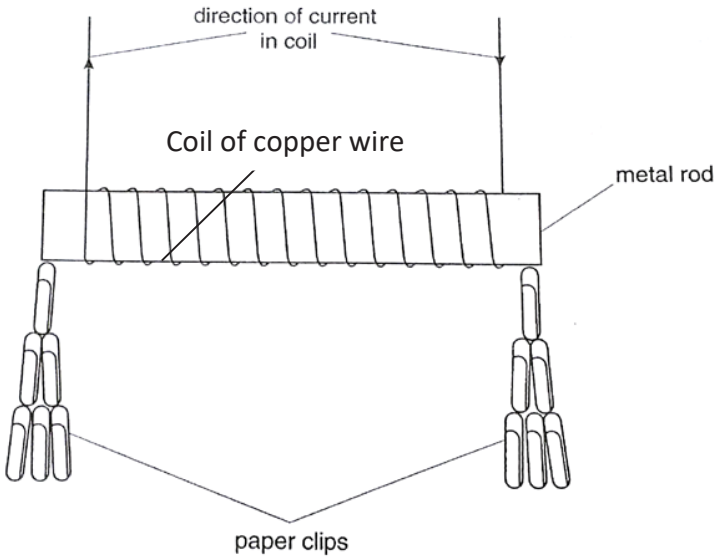
18. An electron is placed near a point charge as shown below. In which direction will the electron move?



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19. Four metal rods are placed, one at a time, inside of coil of copper wire.



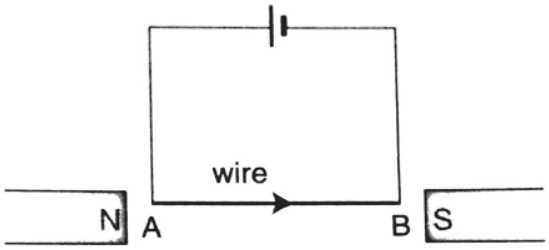
The table below gives the results of the experiment.
Which rod would be the most suitable to use for the core of a coil in a circuit breaker?

metal rod	number of paper clips picked up when there is current in the coil	number of paper clips still attracted when the current is switched off
A	1	0
B	20	2
C	35	0
D	35	30

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20. A wire is suspended between two magnets. The ends of the wire AB are connected to a d.c. supply and the current flows through the wire as shown in the figure.



Which of the following describes how the wire AB will move?

A Wire AB will move into the paper.
B Wire AB will move out of the paper.
C Wire AB will move towards the right
D Wire AB will remain stationary.

********** End of Paper 1 ***********

MCQ Answers

SCIENCE PHYSICS
Q 1 – 5 : BBDAA **Q 6 – 10 : BBDAA**
Q 11 – 15 : DABAD **Q 16 – 20: BDDCD**

SCIENCE BIOLOGY
Q 21 – 15: ADBAC **Q 26 – 30 : ACCBC**
Q 31 – 35: CDCAC **Q 36 – 40 : CBCAD**

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中正中学 (义顺)

Preliminary Examinations (2018)
Secondary Four Express / Five Normal Academic

Candidate			
	Name	**Register No.**	**Class**

SCIENCE PHYSICS

5076/02, 5077/02

Paper 2

Date: 20 August 2018

Duration: 1 hr 15min

No Additional Materials are required.

READ THESE INSTRUCTIONS FIRST

Write your name, class and register number in the spaces at the top of this page.
Write in dark blue or black pen.
You are to use a soft pencil for any diagrams or graphs.
Do not use paper clips, highlighters, glue, correction fluid or correction tape.

Section A (45 marks)
Answer **all** questions in the spaces provided.

Section B (20 marks)
Answer any **TWO** questions in the spaces provided.

The number of marks is given in brackets [ ] at the end of each question or part question.
The use of an approved scientific calculator is expected, where appropriate.

For Examiner's Use	
Section A	
Section B	
Total	

Setter: Mr Thong Nai Kee

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Section A [45 marks]
Answer ALL questions in this section in the spaces provided.

1. A compass needle is subject to two forces as shown in **Fig. 1**.

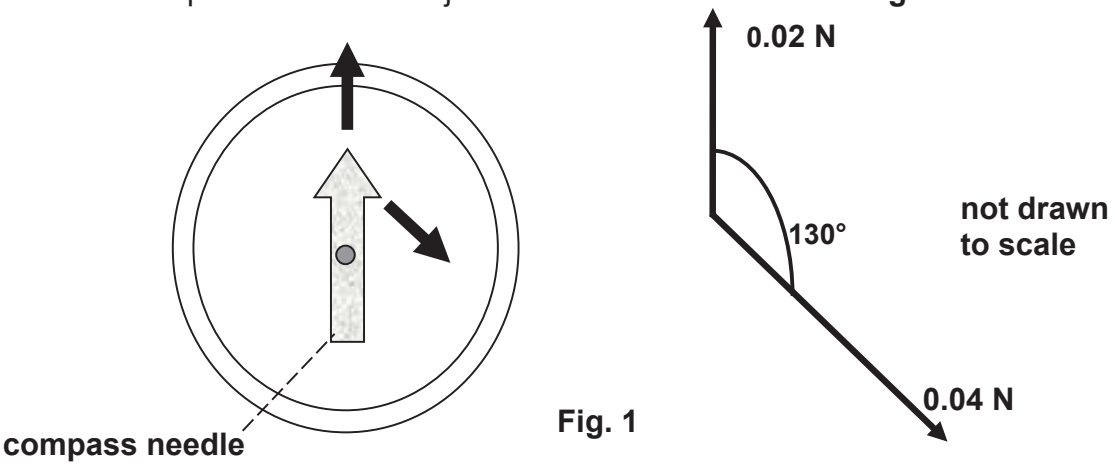


Fig. 1

By making a scale drawing on the space provided below, determine the resultant force on the needle.

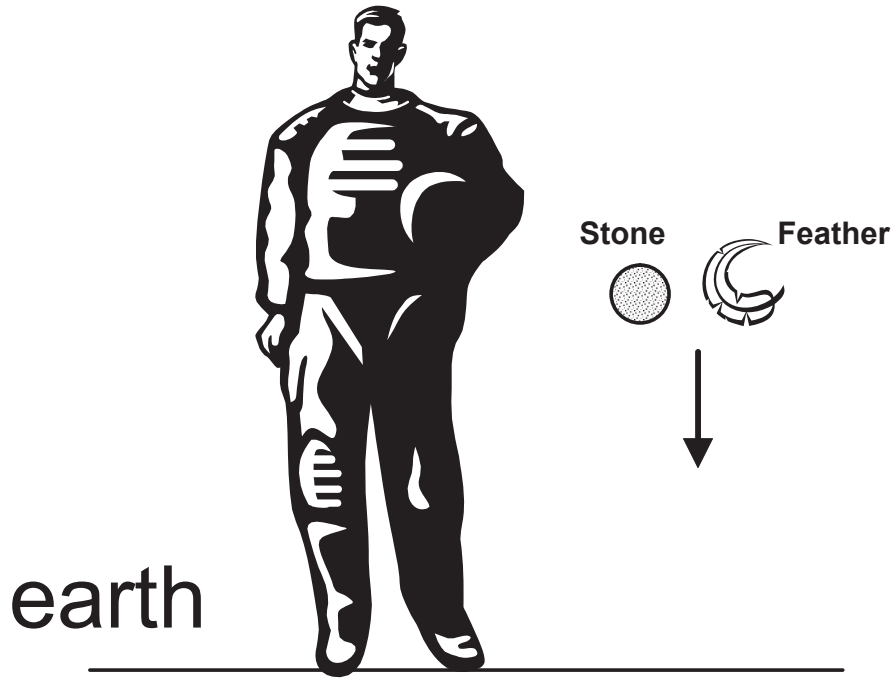
Scale used: ……..
Diagram:

Magnitude of resultant force =…… [4]

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2 The diagram below shows a man dropping a stone and a feather on earth.



(a) State the initial acceleration of the stone and feather on Earth upon release?

…… [1]

(b) It is observed that the stone dropped faster than the feather.

(i) Explain the reason for the feather to fall at constant speed, in terms of forces acting on the feather.

.....

……

……[1]

(ii) Explain the reason for the stone to fall at acceleration, in terms of forces acting on the stone.

.....

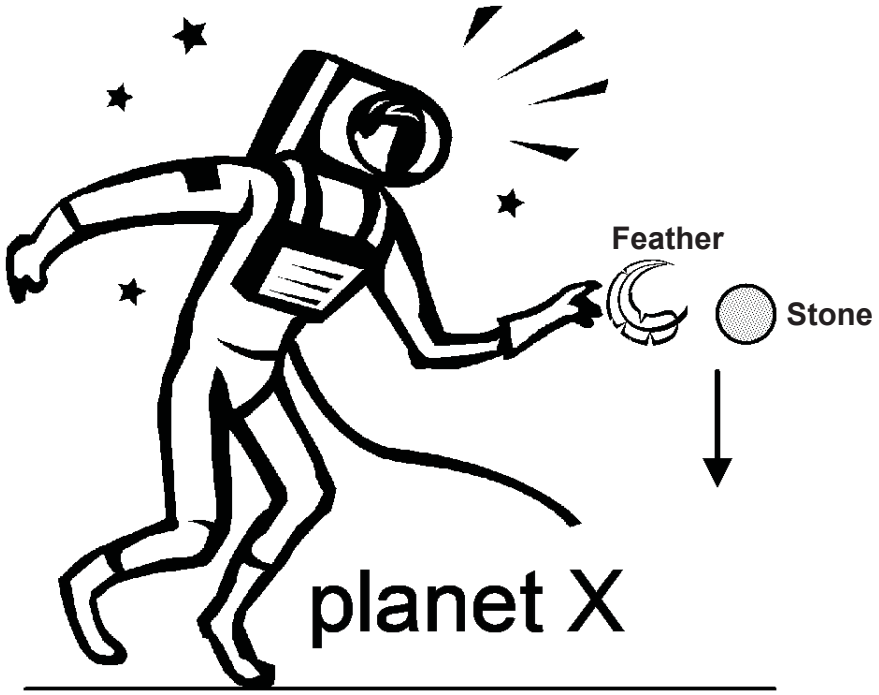
……

……[1]

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(c) The same stone and feather are brought to planet X with the same gravitational acceleration as earth but without air.



State two differences about the motion of the stone and the feather as compared to the motion when they are on Earth.

……

……

……

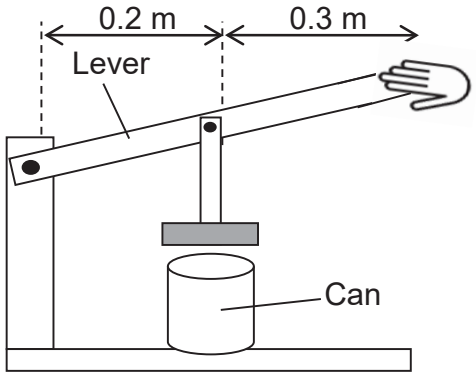
……

……[2]

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3. The diagram shows a simple machine used to crush cans. The lever is pushed downwards by the hand to crush a can.



(a) Explain how the design of this machine makes it easier to crush the cans.

……

……

……..[2]

(b) Mark on the diagram, **<u>two</u>** forces acting on the lever while a can is crushed. [2]

(c) A downward force of 50 N is applied at the handle. Calculate the force acting on the can.

[2]

(d) If the radius of the can is 3 cm, calculate the pressure acting on the can in pascals. [2]

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4. **Fig. 4** shows the inside of a refrigerator.

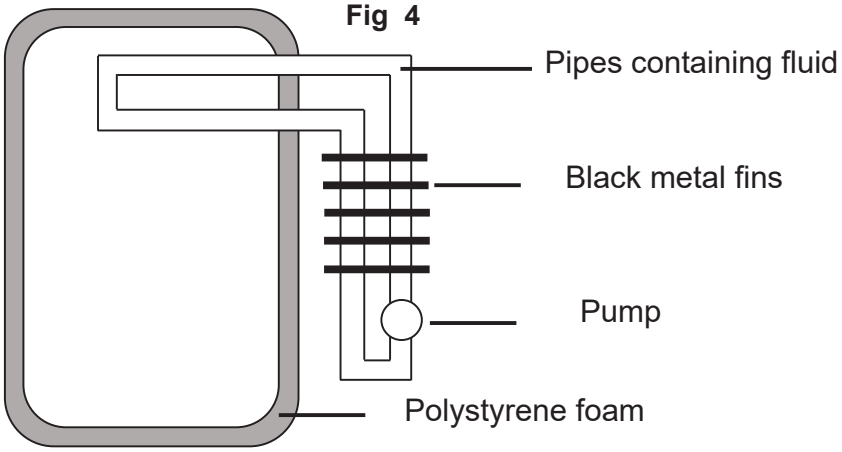


Fig 4

A fluid is pumped through the pipes, which takes the heat away from the top part of the refrigerator. The heat energy is released into the air through the black metal fins.

(a) Explain how the entire fridge is kept cool as heat is removed from the top part of the refrigerator.

……

……

……

……[3]

(b) Explain why the fins are painted black in colour.

……

……

……[2]

(c) Explain how the layer of polystyrene foam helps to keep the contents of the refrigerator cool.

……

……

……[2]

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5. **Fig. 5** shows an object that is placed in front of a thin converging lens.

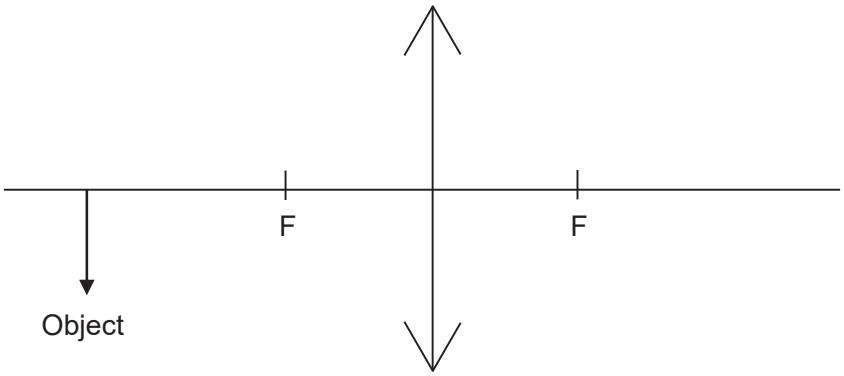


Fig. 5

(a) Construct a ray diagram to locate the image formed. [2]

(b) State three characteristics of the image formed.

……. [1]

(c) Describe how the following will change when the object is shifted nearer towards the focal point of the lens.

(i) Distance of image from the lens

……..…..[1]

(ii) Focal length of the lens

..…… [1]

(iii) Size of image

…….. [1]

(iv) The frequency of light from the object does not change as it enters the lens. State what happens to the speed and wavelength of light as it enters the lens.

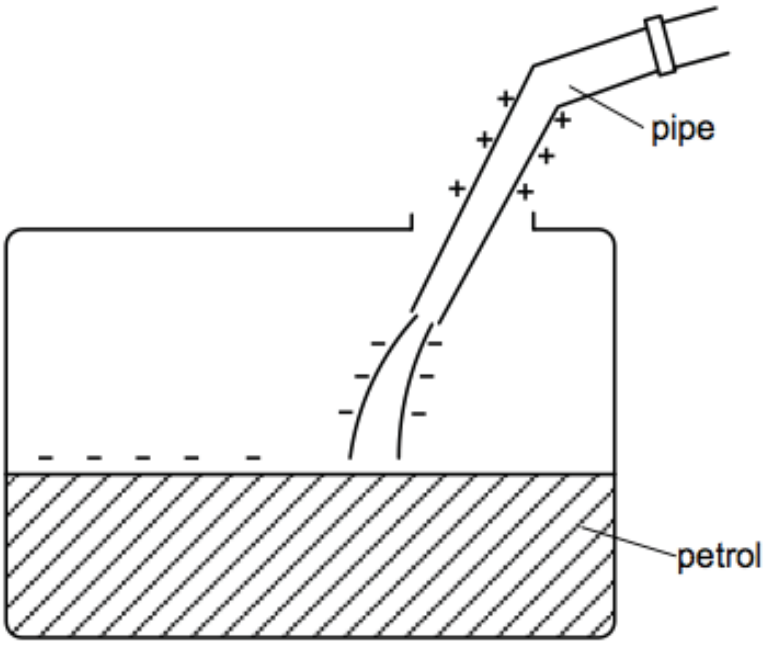
Speed : ..……[1]

Wavelength: ……..……[1]

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6. The diagram shows petrol being pumped into a can.



Electrostatic charges builds up on the petrol and the pipe.

(a) Explain how the pipe becomes positively charged and the petrol becomes negatively charged.

……

……

……[2]

(b) Explain why it is dangerous to allow the electrostatic charges to continue to build up.

……

……[1]

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7. **Fig 7.1** shows an electrical circuit with 4 resistors and a single bulb of resistance 4.0 Ω.

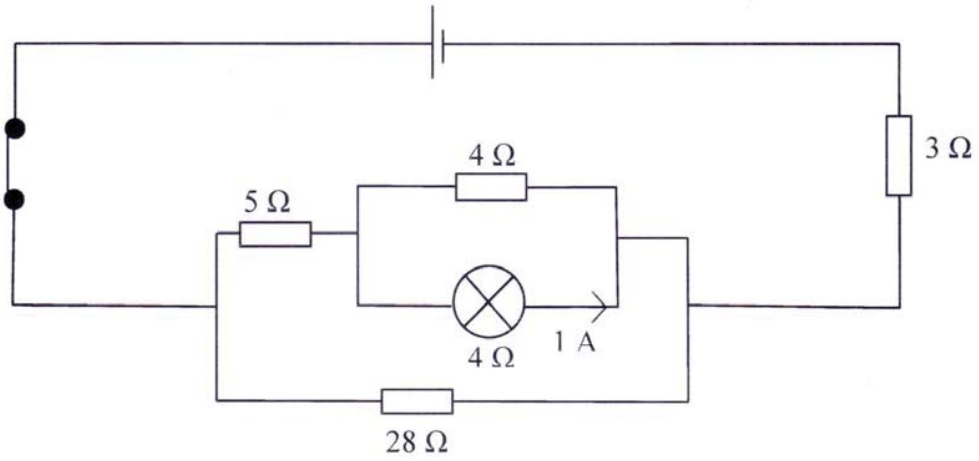


Fig 7.1

(a) Explain what is meant by the term ***electromotive force.***

……

……[1]

(b) Given that the current flowing through the bulb is 1.0 A, determine

(i) the current flowing through the 5.0 Ω resistor. [1]

(ii) the potential difference across the 28 Ω resistor [2]

(iii) the current flowing through the 3.0 Ω resistor, [1]

(iv) the power dissipated in the 3.0 Ω resistor. [2]

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8. A sound from an electronic organ is played into a microphone which is connected to a cathode-ray oscilloscope (c.r.o.). **Fig 8.1** shows the trace on the c.r.o. produced by the sound.

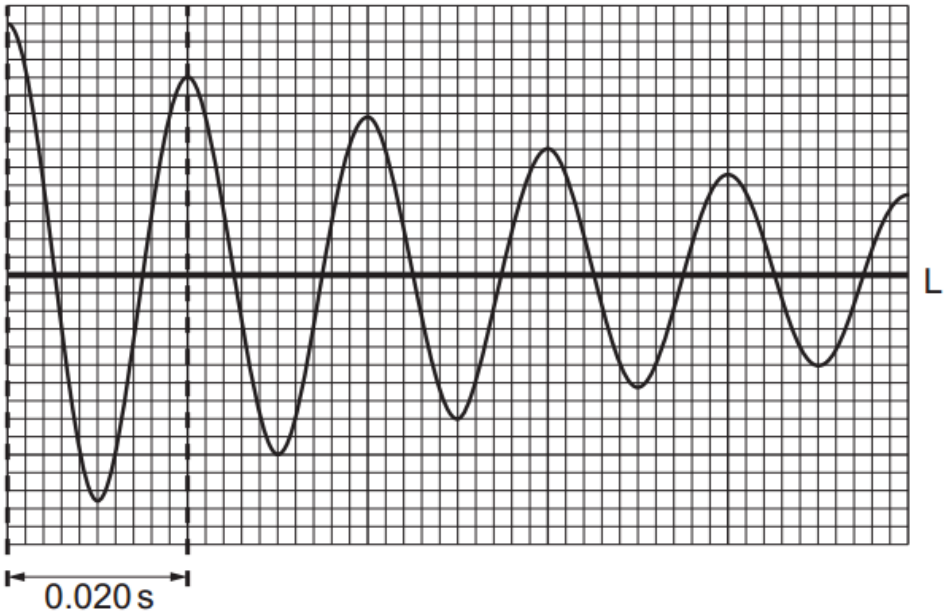


Fig 8.1

From **Fig 8.1,**

(a) state which property of the sound changes with time.

.....[1]

(b) state which property of the sound is kept constant.

.....[1]

(c) determine the time taken for the amplitude of the trace in **Fig. 8.1** to decrease to half its initial value.

Time = ...s [1]

********** **End of Section A** **********

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Section B (20 marks)
Answer any **two** questions in the spaces provided.

9. **(a) Fig. 9.1** shows a cable containing three wires colored brown, blue and yellow/green, and a mains plug with the cover removed.

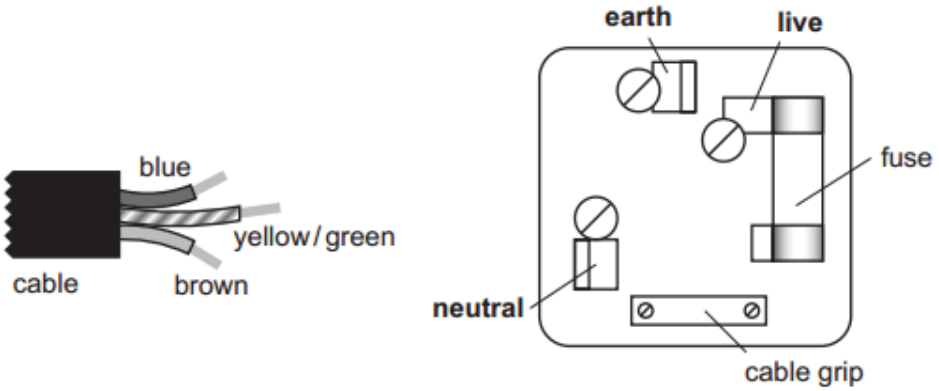


Fig 9.1

Describe how to connect the cable and the three wires correctly and safely to the plug.

.....

.....

.....

.....

.....[3]

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(b) The table lamp shown in **Fig. 9.2** is made from plastic. It has only two wires in the cable to connect it to the plug.

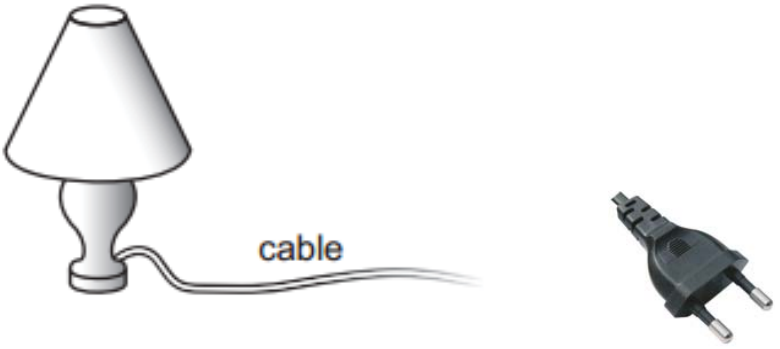


Fig 9.2

The lamp has a power rating of 100 W and is used with a 230 V supply.

(i) Which wire, earth, live or neutral, is not needed in the cable for the lamp?

……[1]

(ii) Explain why the lamp is safe to use even though it has only two wires in the cable.

……

……

…… [2]

(iii) Explain the working principle of a fuse.

……

……[1]

(iv) Suggest the value of the fuse that should be used in the plug for this lamp. Show your workings clearly.

fuse value = ……[3]

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10. **(a) Fig. 10.1** shows a wire passing through a hole in a horizontal, plastic board.

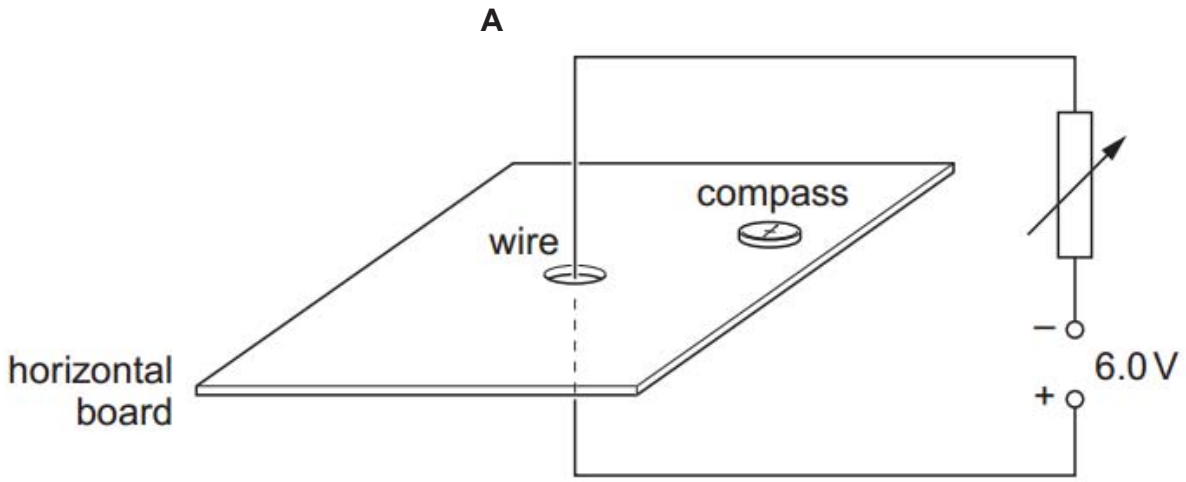


Fig 10.1

A student moves a small compass around the board and plots the magnetic field lines due to the current.

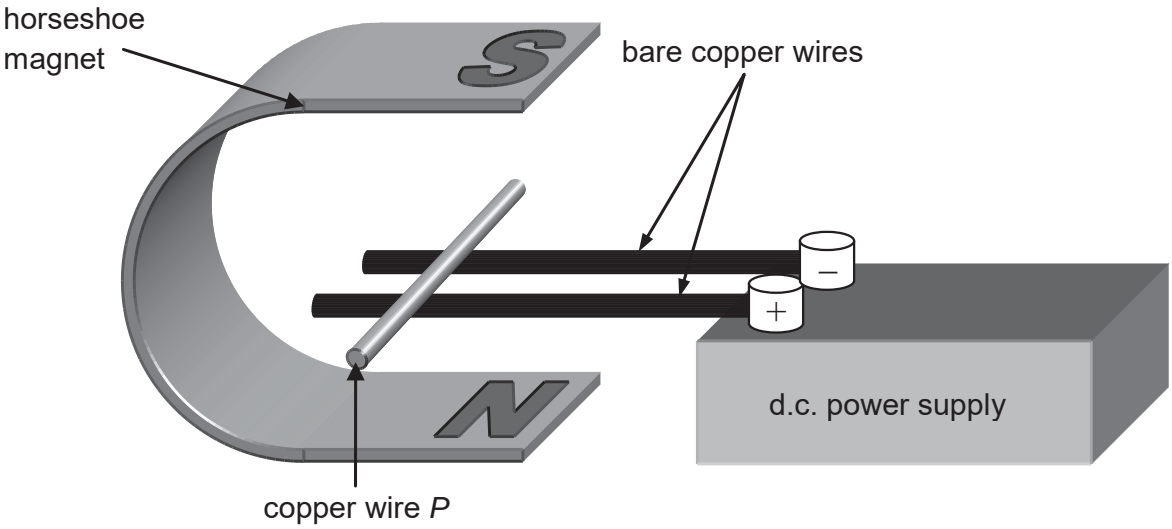
Draw a diagram of the board as seen from above (point **A)** and mark on it the magnetic field lines due to the current. [3]

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(b) Fig 10.2 below shows an apparatus used to demonstrate the motor effect.
P is a short length of bare copper wire resting on two other bare copper wires.

Fig. 10.2



(i) State the direction the copper wire P would roll when the **d.c**. power supply is switched on.

……[1]

(ii) Explain the observation made in **(i)**.

……[2]

(c) What difference would you notice if the following changes are made?

(i) The current is reversed.

……[1]

(ii) The magnetic field is reversed.

……[1]

(d) State and explain what is observed if the power supply is changed to an alternating current that has a low frequency.

……

……

……[2]

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11 **(a)** A petrol driven car accelerates from rest to its cruising speed along a straight level road.

(i) State the energy changes in the car.

…… [1]

(ii) The car now climbs a slope at a constant speed. State and explain, in terms of energy changes, whether the rate of petrol consumption will increase, stay the same or decrease.

……

……[2]

(b) **Fig. 11.1** below shows a roller coaster cart and a track. The mass of the cart is 250 kg and it starts from rest at point **A**.
The acceleration of free fall is 10 m/s^2.

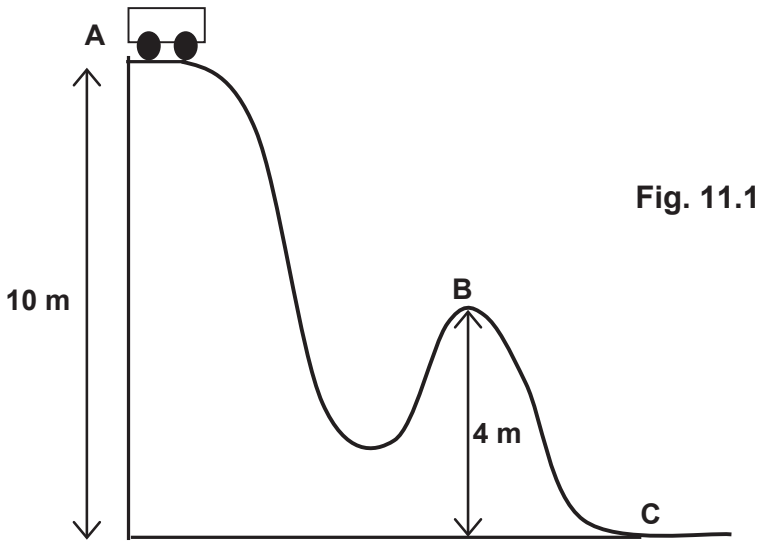


Fig. 11.1

(i) State the principle of conservation of energy.

……

……

……[1]

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(ii) Calculate the loss in gravitational potential energy of the cart between point **A** and **B**. [2]

(iii) The speed of the roller coaster at **B** is 10 m/s.
Calculate the increase in kinetic energy as the cart travels from **A** to **B**.
[2]

(iv) Suggest why the loss in gravitational potential energy and the increase in kinetic energy are different and explain how the law of conservation of energy applies to this situation.

……

……

…… [2]

********** **End of Paper** **********

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Marking scheme (CCHY Prelim 2018 Science Physics

1. Scale (diagram should be at least half of the space provided. 1m
   0.02 N and 0.04 N vectors correctly oriented 1m
   Resultant force correctly 1m
   Magnitude of resultant force = 0.031 N
   (accept between 0.028N and 0.034N)

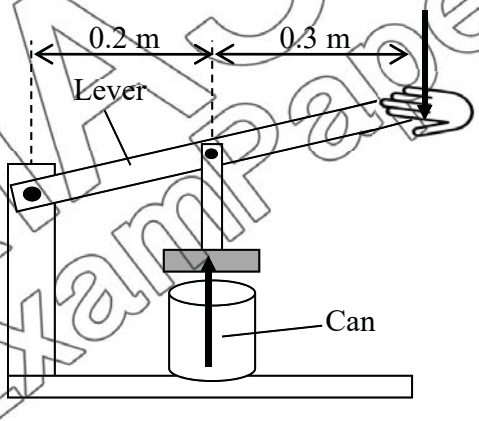
2. (a) 10 m/s^2 1m
   (b) (i) The *weight of the feather is equal to the air resistance acting against it, hence resultant force acting on the feather is zero (zero acceleration).*

   (ii) The *weight of the stone is higher than the air resistance acting against it.*

   (c) - The speed of the stone and feather on planet X is faster than the speed of the stone and feather on Earth.
   - The stone and feather on planet X drop at the same acceleration and hence hit the floor at the same speed and time.

3. (a) As the effort is far away from the pivot [1], this allow the hand to use a smaller force [1] to create the certain clockwise moment that produce a large crushing force on the can.

(b) **2**



Forces as shown in the diagram [1 m each]

(c) 50 x 0.5 = F X 0.2 [1]
F = 125 N [1]

(d) P = 125 / (3.14 x 0.03^2) [1]
= 44232
442 00 Pa (3sf)) [1]

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4 (a) As the air at the top is cooled, it contracts, become denser and sinks. 1m
The warmer air at the bottom is less dense and rises. 1m
As a result, this movement of air sets up a convection current which cools the fridge down. 1m

(b) Black surface is a good emitter of heat [1] and will increase the amount/rate of heat radiated into the air from the fluid.[1]
(c) Polystyrene is a poor conductor of heat [1] and will reduce the amount/rate of heat entering the refridgerator by conduction.[1]

5 (a) 1 ray to cut through optical center without bending. 1m
1 ray parallel axis to cut through focal point upon striking the lens.1m

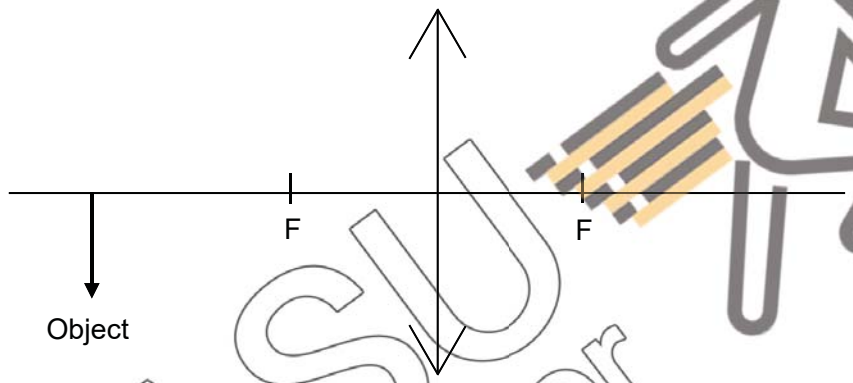


Fig. 5

(b) Diminished, real and inverted 1m
(c) (i) Increase 1m
(ii) Remain the same 1m
(iii)Increase 1m
(iv) Speed decreases. 1m
Wavelength decreases. 1m

6 (a) Charging by friction occurs when petrol rubs against [1] the pipe as it is being pumped. Electrons are transferred from pipe to the petrol [1] making the pipe positively charged and the petrol negatively charged.

(b) Sparks could be induced when the pipe is brought close to the can and this would ignite the petrol [1].

7 (a) Work done by the source in driving a unit charge around a complete circuit. 1m
(b) (i) $I_{5\Omega} = I_{4\Omega} + I_{bulb}$
$=1 + 1$
$= 2A$
(ii) $V = IR_T$
$= 2$ ($R_{5\Omega}$ in series with 2 parallel 4Ω resistors)
$=2 \times 7 = 14V$

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(iii) $I_{3\Omega} = I_{5\Omega} + I_{28\Omega}$
$= 2 + 14/28$
$= 2.5A$

(iv) $P_{3\Omega} = I^2R$
$= (2.5)^2(3)$
$=18.8$ W

8 (a) loudness [1]
(b) Pitch [1]
(c) 0.06s [1]

9 (a) Blue to neutral, yellow green to earth, brown to live wire to cable grip [3]

(b) (i) earth 1m
(ii) plastic/lamp/cover/base made from insulator/does not conduct electricity [1]
doubly insulated or plastic/lamp/cover/base cannot be live or cannot electrocute/shock [1]
(iii) The fuse consists of a wire that will melt when current exceeds its fuse rating an hence open the circuit.
(iv) P = VI (in any form numerical or algebraic)
0.43(48) [1]
Fuse: 0.5/1.0 A [1]

10 (a) at least 2 concentric, complete circles 1m
Increasing gap 1m
at least 1 anticlockwise arrow and none incorrect 1m

(b) (i) Roll to the ***right*** (towards the d.c. power supply) [**1**] [accept move to right]

(ii) When the power supply is switched on, ***current*** flows through wire *P* in a direction that is ***into*** the plane of the ***page*** which is ***perpendicular*** to the ***magnetic field*** direction (upward). [**1**]
By Fleming's Left-Hand-Rule, a ***force to the right*** acts on wire P. [**1**]

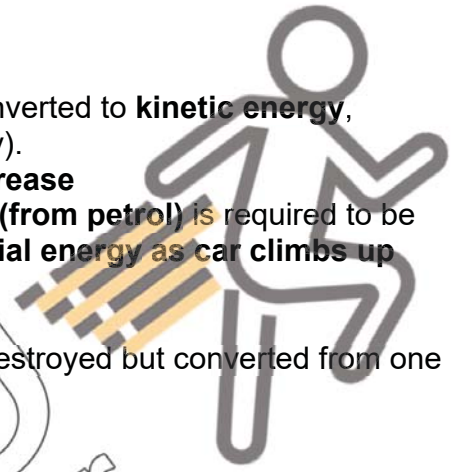
(c) (i) P rolls to the **left**. [**1**]
(ii) P rolls to the **left**. [**1**]

(d) P will **oscillate left and right repeatedly** as long as the a.c. is supplied. [**1**]
The **periodic change in direction of** the **current** in wire P will **cause** the **force** on the wire to **switch from left to right to left repeatedly**. [**1**]

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11 **(a) (i)** **Chemical potential energy** is converted to **kinetic energy**, (thermal energy and sound energy). [1]

(ii) rate of petrol consumption will **increase** [1]
More **chemical potential energy (from petrol)** is required to be converted to **gravitational potential energy as car climbs up the slope** [1]

(b) **(i)** Energy cannot be created or destroyed but converted from one form to another. [1]

(ii) use of mgh
= 250(10)(6) [1]
= 15000 J [1]

(iii) use of ½ mv^2
= ½ $(250)(10)^2$ [1]
= 12500 J [1]

(iv) slope is **not smooth / rough** [1]
gravitational potential energy is converted into kinetic, **thermal and sound energy**. [1]

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