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Geylang Methodist School (Secondary) Preliminary Examination 2020

SCIENCE (PHYSICS, CHEMISTRY)

5076/01

Paper 1 Multiple Choice

Sec 4 Express
Sec 5 Normal (A)

Additional materials : Optical Answer Sheet

1 hour

Setter : Mr Andrew Kang
Mrs Khalidah

1 September 2020

READ THESE INSTRUCTIONS FIRST

Write in soft pencil.

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

Write your name, index number and class on the Optical Answer Sheet in the spaces provided.

There are **forty** questions on this paper. Answer **all** questions. For each question there are four possible answers **A, B, C** and **D**.

Read the instructions on the Optical 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 paper.

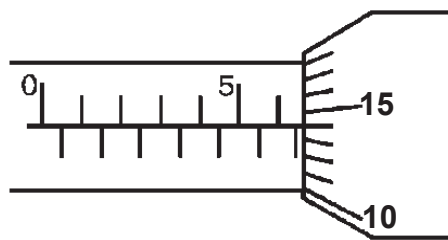
Gravitational field strength is assumed to be 10 N/kg unless otherwise specified.

A copy of the Periodic Table is printed on page **17**.

1. Which of the following shows the multiples of prefixes arranged in an ascending order?

- A** nano, micro, mega, giga
B giga, nano, mega, micro
C micro, nano, mega, giga
D micro, nano, giga, mega

- 2.** The diagram shows a micrometer.



What is the reading shown?

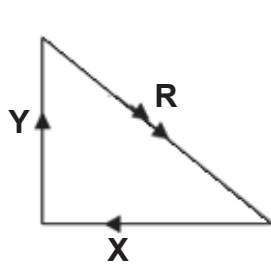
- | | |
|----------|----------|
| A | 6.014 mm |
| B | 6.14 mm |
| C | 6.514 mm |
| D | 6.64 mm |

- 3.** A stone is released from rest and falls freely due to gravity. If the acceleration of free fall is 10 m/s^2 , which of the following is true?

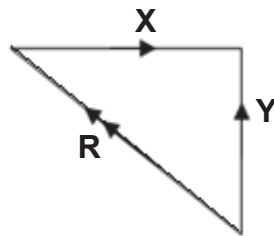
- A** The stone is travelling with constant velocity as it falls freely.
B Acceleration is 0 m/s^2 when the stone is released from rest.
C After 2.0 s , the acceleration is 20 m/s^2 .
D The speed of the stone is 30 m/s after 3.0 s .

4. Two forces **X** and **Y** acting on a ball produce a resultant force **R** on the ball.

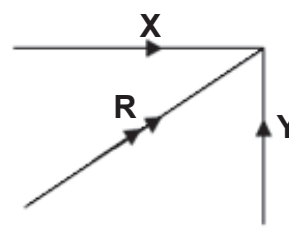
Which of the following vector diagrams correctly represents the addition of the forces **X** and **Y** to produce **R**?



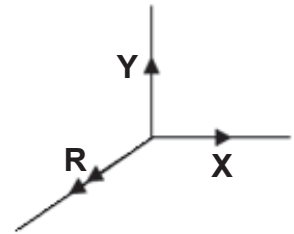
A



B

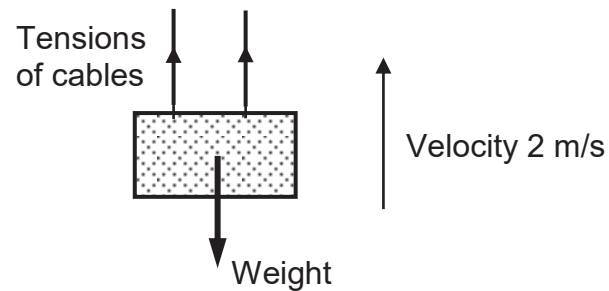


C



D

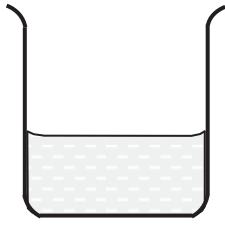
5. A lift of weight 3000 N is travelling up with a uniform velocity of 2 m/s.



Taking gravitational acceleration as 10 m/s^2 , what is the resultant force on the lift?

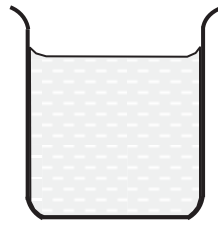
- A 0 N
 B 750 N
 C 1500 N
 D 3000 N

6. Three liquids are poured into beakers as shown.



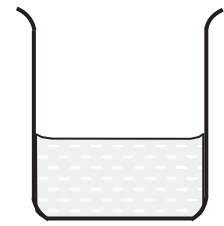
Beaker with liquid **F**

Mass : 50 g
Volume : 50 cm³



Beaker with liquid **G**

Mass : 100 g
Volume : 100 cm³

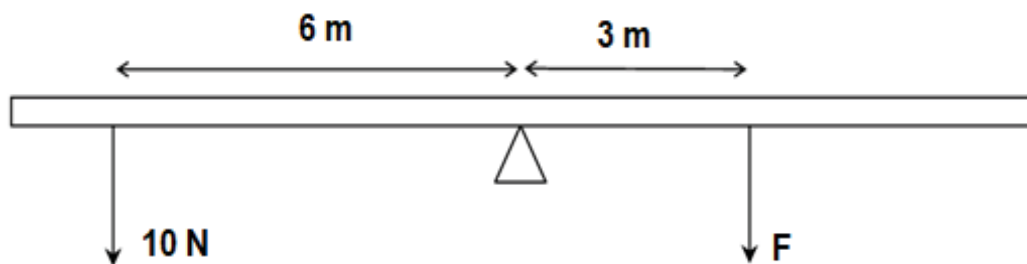


Beaker with liquid **H**

Mass : 100 g
Volume : 50 cm³

Which statement about densities of the liquids is correct?

- A** Liquid **G** has twice the density of liquid **H**.
 - B** Liquid **H** has twice the density of liquid **F**.
 - C** All three liquids have different densities.
 - D** All three liquids have the same density.
7. A force of 10 N acts on a uniform bar which is supported on a pivot at the centre of the bar as shown.



What is the magnitude of the force, **F**, required to balance the bar?

- A** 10 N
- B** 20 N
- C** 30 N
- D** 40 N

8. A standing man has a total contact area of 0.04 m^2 between his feet and the ground. The man has a mass of 60 kg.

Calculate the pressure exerted on the ground by the man.

- A 0.15 Pa
- B 150 Pa
- C 1500 Pa
- D 15 000 Pa

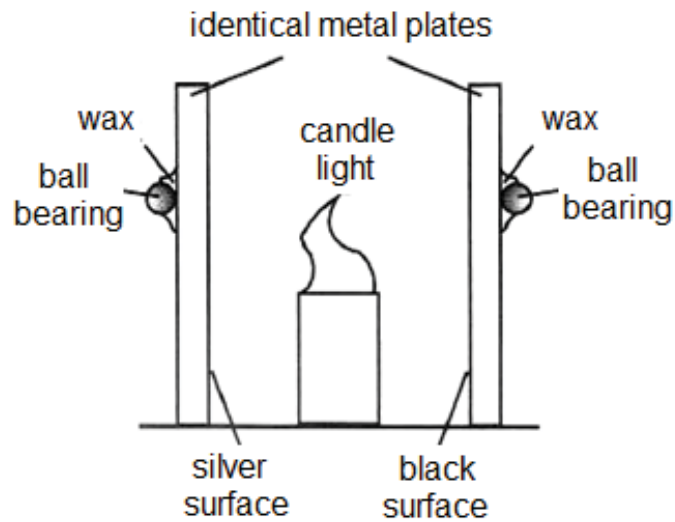
9. The diagram below shows a box pulled by a 5 N force. A frictional force of 3 N acts in the opposite direction.



What is the work done against friction by the box if it moves 5 m?

- A 10 J
- B 15 J
- C 25 J
- D 40 J

10. Two ball bearings are attached to the outer sides of two metal plates by wax as shown.

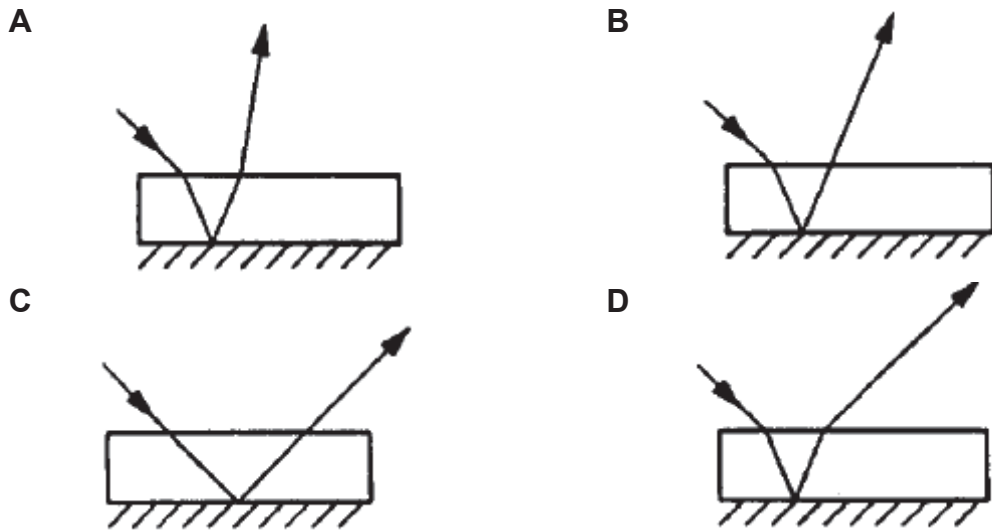


A candle light is placed mid-way between the two identical metal plates. The ball bearing on the right fell first.

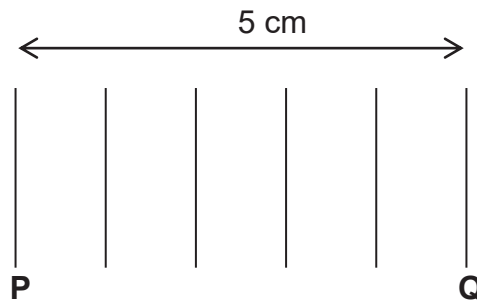
Which of the following conclusions is correct?

- A** Black surface is a better absorber of radiation than silver surface.
 - B** Black surface is a better thermal conductor than silver surface.
 - C** Black surface helps the convection of heat.
 - D** Black surface is a better emitter of radiation than silver surface.
11. Which of the following correctly describes the image formed by a thin converging lens when used as a telescope?
- A** virtual, erect, magnified
 - B** virtual, inverted, diminished
 - C** real, erect, magnified
 - D** real, inverted, diminished

12. The bottom surface of a glass block is silvered to act as a mirror. Which diagram could represent the path of a light ray which enters this block through the top surface?



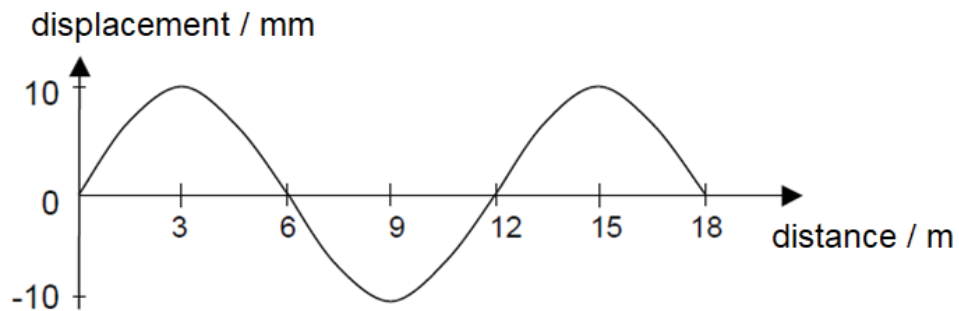
13. The diagram below shows 6 wavefronts of ripple travelling forward from **P** to **Q** in a ripple tank.



If the time to travel from **P** to **Q** is 6.0 s, what is the wavelength and speed of the wave?

	Wavelength / cm	Speed / m/s
A	0.83	0.0017
B	1.0	0.0083
C	0.83	0.14
D	1.0	0.83

14. A radiowave passing through air produces displacement of air molecules at a particular instant in time. Its displacement-distance graph is shown.



Taking the speed of light to be 3.0×10^8 m/s, what is the frequency of this radiowave?

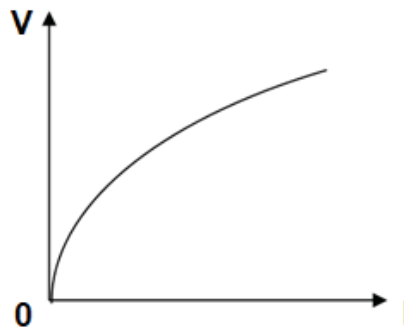
- A** 1.7×10^7 Hz
B 2.5×10^7 Hz
C 5.0×10^7 Hz
D 2.5×10^{16} Hz
15. A loudspeaker consists of a cone that vibrates to and fro. If the cone is made to vibrate further from its equilibrium position, the sound will become
- A** higher pitched.
B lower pitched.
C louder.
D softer.
16. How is a positively-charged sphere mounted on an insulating stand made neutral by someone touching it?
- A** Protons flow from the object.
B Electrons flow from the object.
C Protons flow onto the object.
D Electrons flow onto the object.

17. When a plastic comb is placed next to a small piece of aluminium foil hanging from a nylon thread, the foil is repelled by the comb.

Which one of the following statements is true?

- A The comb is charged and the foil is uncharged.
- B The comb is uncharged and the foil is charged.
- C The comb and the foil have charge of the same sign.
- D The comb and the foil have charge of opposite signs.

18. The **V-I** characteristic graph of a conductor is as shown in the figure.



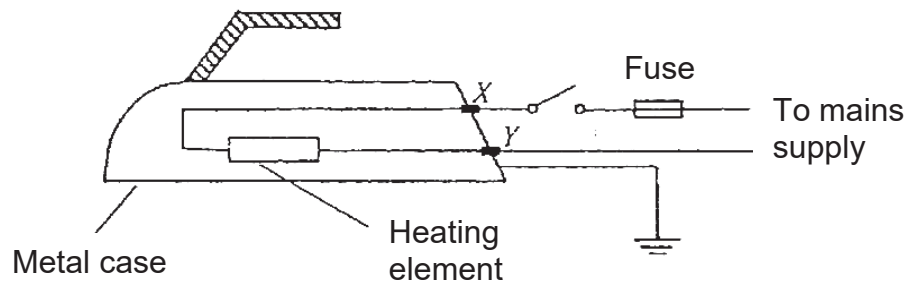
Which of the following statements about the conductor is correct?

- A Its resistance decreases as the current increases.
- B The conductor has a fixed resistance.
- C It is an ohmic conductor.
- D Current is directly proportional to potential difference.

19. How many kWh of electricity are consumed when a 4000 W electric oven is used for cooking for 30 minutes?

- A 2.0 kWh
- B 6.0 kWh
- C 120 kWh
- D 12 000 kWh

20. The figure below shows the main parts of an electric iron.



In which of the following situations will the fuse blow when the switch is closed?

- A** The fuse is connected to wire Y instead of wire X.
- B** The insulation at contact Y is worn out and the wire touches the metal case.
- C** The insulation at contact X is worn out and the wire touches the metal case.
- D** The earth wire is removed from the electric iron.

DATA SHEET

The Periodic Table Of Elements

Group

I		II		Key										III		IV		V		VI		VII		0							
				proton (atomic) number atomic symbol name relative atomic mass										1 H hydrogen 1																	
3 Li lithium 7	4 Be beryllium 9																					5 B boron 11	6 C carbon 12	7 N nitrogen 14	8 O oxygen 16	9 F fluorine 19	10 Ne neon 20	2 He helium 4			
11 Na sodium 23	12 Mg magnesium 24																					13 Al aluminium 27	14 Si silicon 28	15 P phosphorus 31	16 S sulfur 32	17 Cl chlorine 35.5	18 Ar argon 40	18 Ar argon 40			
19 K potassium 39	20 Ca calcium 40	21 Sc scandium 45	22 Ti titanium 48	23 V vanadium 51	24 Cr chromium 52	25 Mn manganese 55	26 Fe iron 56	27 Co cobalt 59	28 Ni nickel 59	29 Cu copper 64	30 Zn zinc 65											31 Ga gallium 70	32 Ge germanium 73	33 As arsenic 75	34 Se selenium 79	35 Br bromine 80	36 Kr krypton 84				
37 Rb rubidium 85	38 Sr strontium 88	39 Y yttrium 89	40 Zr zirconium 91	41 Nb niobium 93	42 Mo molybdenum 96	43 Tc technetium –	44 Ru ruthenium 101	45 Rh rhodium 103	46 Pd palladium 106	47 Ag silver 108	48 Cd cadmium 112											49 In indium 115	50 Sn tin 119	51 Sb antimony 122	52 Te tellurium 128	53 I iodine 127	54 Xe xenon 131				
55 Cs caesium 133	56 Ba barium 137	57 – 71 lanthanoids		73 Ta tantalum 181	74 W tungsten 184	75 Re rhenium 186	76 Os osmium 190	77 Ir iridium 192	78 Pt platinum 195	79 Au gold 197	80 Hg mercury 201											81 Tl thallium 204	82 Pb lead 207	83 Bi bismuth 209	84 Po polonium –	85 At astatine –	86 Rn radon –				
87 Fr francium –	88 Ra radium –	89 – 103 actinoids		104 Rf Rutherfordium	105 Db dubnium –	106 Sg seaborgium –	108 Hs hassium –	109 Mt meitnerium –	110 Ds darmstadtium –	111 Rg roentgenium –	112 Cn copernicium –											114 Fl flerovium –	116 Lv livermorium –								

lanthanoids

57	La	lanthanum	139	58	Ce	cerium	140	59	Pr	praseodymium	141	60	Nd	neodymium	144	61	Pm	promethium	—	62	Sm	samarium	150	63	Eu	europium	152	64	Gd	gadolinium	157	65	Tb	terbium	159	66	Dy	dysprosium	162	67	Ho	holmium	165	68	Er	erbium	167	69	Tm	thulium	169	70	Yb	ytterbium	173	71	Lu	lutetium	175
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actinoids

89	Ac	actinium	—	90	Th	thorium	—	91	Pa	protactinium	—	92	U	uranium	238	93	Np	neptunium	—	94	Pu	plutonium	—	95	Am	americium	—	96	Cm	curium	—	97	Bk	berkelium	—	98	Cf	californium	—	99	Es	einsteinium	—	100	Fm	fermium	—	101	Md	mendelevium	—	102	No	nobelium	—	103	Lr	lawrencium	—
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The volume of one mole of any gas is 24 dm^3 at room temperature and pressure (r.t.p.).

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Geylang Methodist School (Secondary) Preliminary Examination 2020

Candidate
Name

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Class

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Index Number

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5076/02

SCIENCE

Paper 2 Physics

**Sec 4 Express
Sec 5 Normal (A)**

Additional materials : Nil

1 hour 15 minutes

Setter : Mr Andrew Kang

25 August 2020

READ THESE INSTRUCTIONS FIRST

Write your name, index number and class on all the work you hand in.
Write in dark blue or black pen on both sides of the paper.
Do not use staples, paper clips, highlighters, glue or correction fluid.

Section A

Answer **all** questions.
Write your answers in the spaces provided.

Section B

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.

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

Acceleration due to gravity, g , is assumed to be 10 m/s^2 unless otherwise specified.

For Examiner's Use	
Section A	/ 45
Section B	/ 20
Total	/ 65

This document consists of **17** printed pages and **3** blank pages.

[Turn over

SECTION A

Answer **all** the questions.

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

1 Convert the following to their respective SI units.

(a) 106 km/h

106 km/h = [1]

(b) 45.6 cm²

45.6 cm² = [1]

(c) 1.2 g/cm³

1.2 g/cm³ = [1]

- 2 A bungee jumper falls from a bridge above a river, as shown in Fig. 2.1.

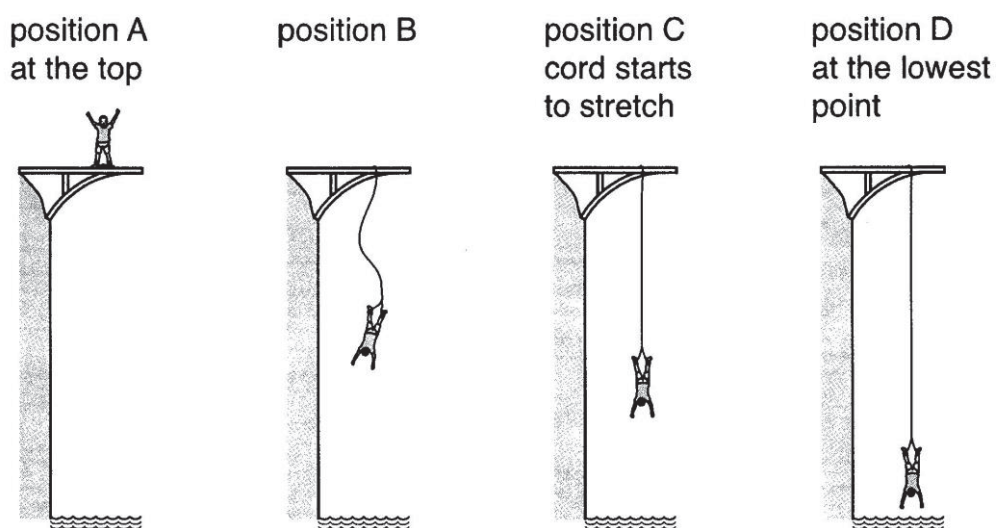


Fig. 2.1 (not to scale)

The man starts from position A in Fig. 2.1. The elastic cord starts to stretch at position C and he stops for the first time at position D. He continues to rise and fall.

Fig. 2.2 shows how the velocity of the man varies with time t .

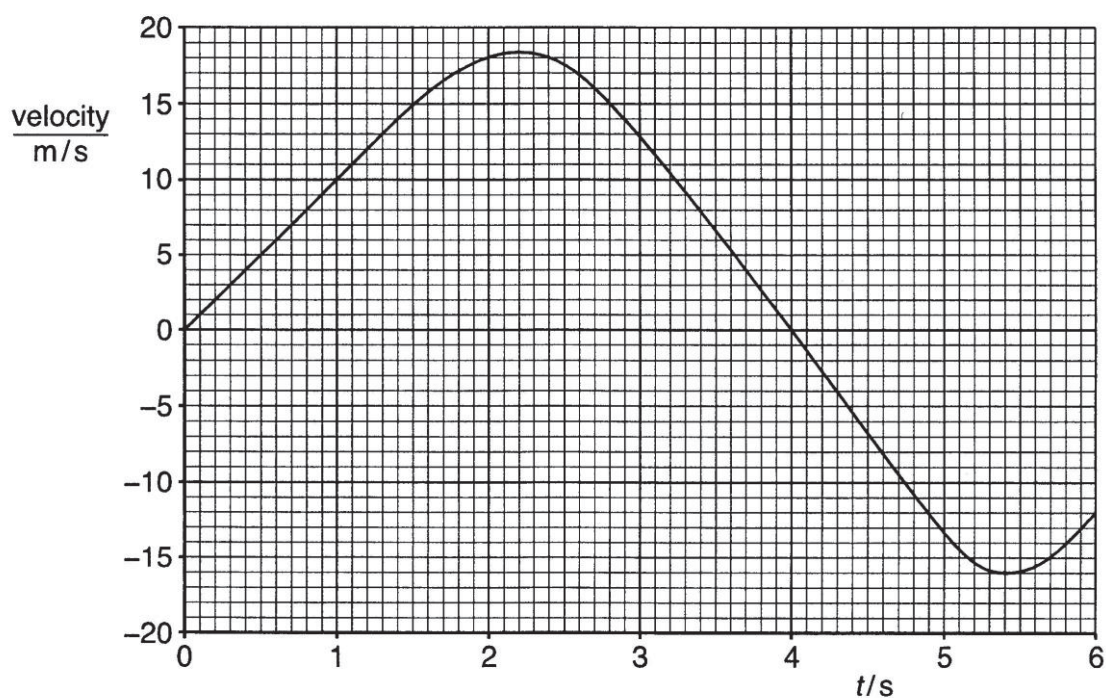


Fig. 2.2

- (a) (i) State what is meant by *velocity*.

.....
 [1]

- (ii) State the difference between a positive velocity and a negative velocity.

.....
 [1]

- (iii) Using values from Fig. 2.2, determine the acceleration of the man in the first 1.4 s.

acceleration = [2]

- (iv) State and explain whether the acceleration you calculated is increasing, decreasing or uniform.

..... [1]

- (v) State the value of t when the man is at position D.

..... [1]

- (vi) Explain, in terms of the forces acting, why the man is accelerating upwards at D.

.....

 [2]

- (b) Fig. 2.3 shows the values for the gravitational potential energy of the man, the kinetic energy of the man and the elastic potential energy in the cord at positions A, C and D. You may ignore the effect of air resistance in this question.

Complete Fig. 2.3 to show the kinetic energy of the man and the elastic potential energy in the cord at C and D. [2]

Position	gravitational potential energy / J	kinetic energy / J	elastic potential energy / J
A	20 000	0	0
C	15 000		
D	0		

Fig. 2.3

- 3 Fig. 3.1 shows a picture of weight **W**, hung on a wall using 2 strings. The figure is not drawn to scale.

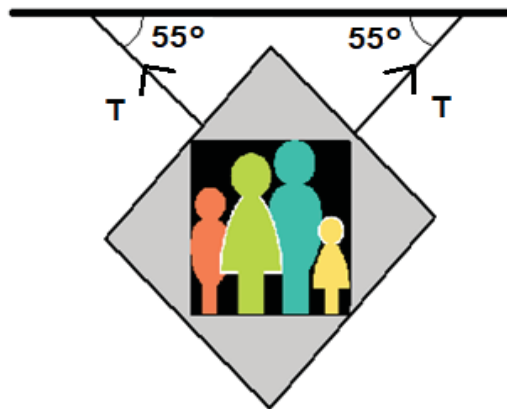


Fig. 3.1

Given that the tension in each of the two strings is 6.0 N,

- (i) Using a suitable scale, determine the resultant force due to the two tensions.

scale:

resultant force = [3]

- (ii) Hence write down the value of the weight **W** of the picture.

..... [1]

- 4** A student performs an experiment to find the density of a liquid.

The measurements he made are:

- I. Mass of empty flask = 25.0 g
- II. Mass of flask completely filled with water = 125.0 g
- III. Mass of flask completely filled with liquid = 105.0 g

- (a) (i)** Given that the density of water is 1.0 g/cm^3 , calculate the volume of water.

volume of water = [1]

- (ii)** Hence, calculate the density of the liquid.

density of the liquid = [1]

- (b)** 100 g of water and 100 g of the liquid are then mixed together.
Calculate the density of the mixture.

density of the mixture = [2]

- 5 Fig. 5.1 shows an object of mass 1.0 kg being thrown vertically upwards from the ground with an initial velocity of 4.0 m/s . It reaches a maximum height h from the ground. You can ignore the effects of air resistance.

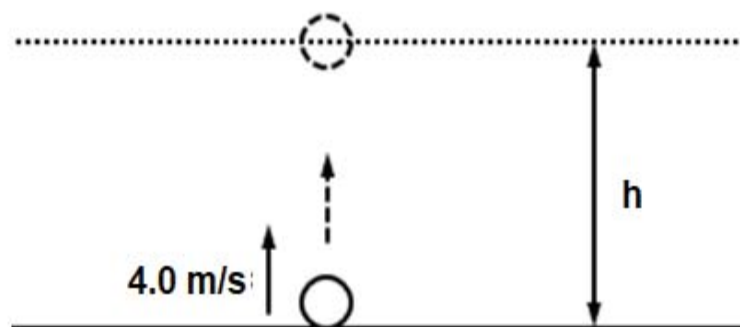


Fig. 5.1

- (i) Calculate the kinetic energy of the object when it is at ground level.

kinetic energy of object = [2]

- (ii) Calculate the speed of the object when it is 0.20 m from the ground.

speed of object = [2]

- (iii) Calculate the maximum height h reached by the object.

maximum height h = [2]

- 6 Solar panels are used to heat water for the house, as shown in Fig. 6.1.

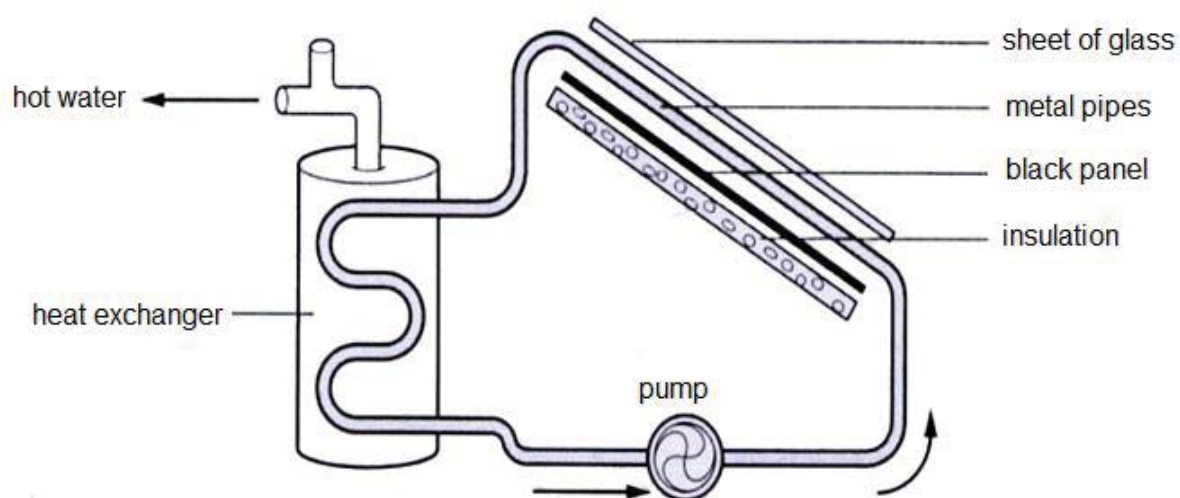


Fig. 6.1

- (a) The solar panels and pipes are of the same colour and texture. State the colour and texture. Explain your answer.

.....

[2]

- (b) Explain why the copper pipe in the heat exchanger is convoluted and not straight.

.....
[1]

- (c) Suggest a suitable material for the layer of insulation. Explain your choice of material.

.....

[2]

- (d) State the function of the sheet of glass.

.....
 [1]

- 7 A student placed some solid **Z** in a test tube and heated it with a Bunsen burner until it fully melted. He then allowed **Z** to cool. A thermometer was inserted to measure the temperature changes. The result is shown in Fig. 7.1.

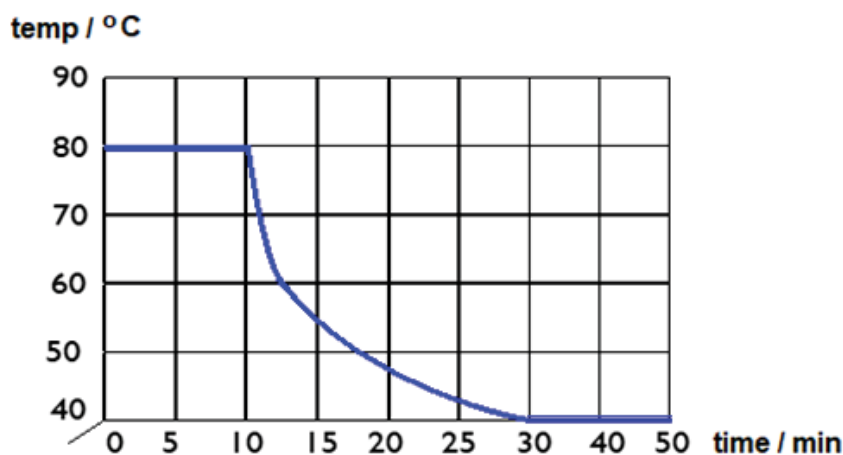


Fig. 7.1

- (a) In terms of kinetic theory, explain why the temperature remains constant between 0 to 10 min.
- [1]
- (b) Write down the melting point of **Z**.
- [1]
- (c) Suggest a reason for the shape of the graph from 10 to 30 min.
- [1]
- (d) Explain why the graph is horizontal from 30 to 50 min.
- [1]
- (e) (i) Indicate on Fig. 7.1, the graph that you would expect if he had covered the outer part of the test tube with dark grey paint. [1]
- (ii) Explain your answer to (e)(i).
- [2]

- 8** Ultrasound scanning is a technique used in the medical field to obtain information about the internal structure of the human body without the need for surgery.

An ultrasound of frequency 3.0 MHz is beamed into a body from a transmitter placed on the body surface.

The time taken for the sound reflected by different surfaces in the body to return to the transmitter is measured.

- (a)** State what is meant by a frequency of 3.0 MHz.

.....
..... [1]

- (b)** The average speed of sound in the body is 1.5 km/s.
Calculate the wavelength of the ultrasound waves traveling in the body.

wavelength = [2]

- (c)** When a short pulse of the ultrasound is beamed into the body, a reflected sound wave is received by the transmitter 0.25 ms later.

Calculate the distance from the surface of the body to the layer that produces the reflection.

distance = [2]

End of Section A

SECTION B

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

- 9 (a) Fig. 9.1 shows a simple machine used to crush cans. The lever is pushed downwards by the hand to crush a can.

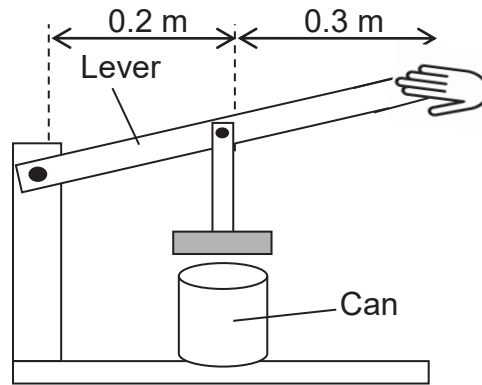


Fig. 9.1

- (i) Mark on Fig. 9.1, **two** forces acting **on the lever** while a can is crushed. [2]
- (ii) A downward force of 50 N is applied at the handle. Calculate the force acting on the can.

force = [2]

- (iii) If the radius of the can is 3 cm, calculate the pressure acting on the can in pascals.

pressure = [2]

- (b) An air stewardess explained that she packed her luggage with the heaviest items placed at the end where the wheels are, so that the heaviest items do not crush the other items.



- (i) State and explain two other advantages of packing the luggage this way.

Advantage 1:

 [1]

Advantage 2:

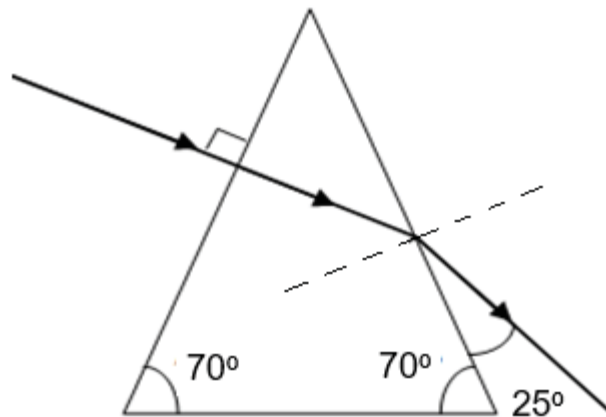
 [1]

- (ii) The handle to the luggage can also be extended so that it is easy to reach. Describe another advantage of having a longer handle.

.....

 [2]

- 10 (a)** Fig. 10.1 (not drawn to scale) shows a ray of monochromatic light incident on a glass prism. The final angle between the emergent ray and the surface of the prism is 25° as shown.



- (i) Determine the angle of incidence as light travels from the glass prism into air.

angle of incidence = [1]

- (ii) Hence, calculate the refractive index of the glass prism.

refractive index = [2]

- (iii) Calculate the speed of light in the glass prism if the speed of light in air is $3.0 \times 10^8 \text{ ms}^{-1}$.

speed of light in glass prism = [2]

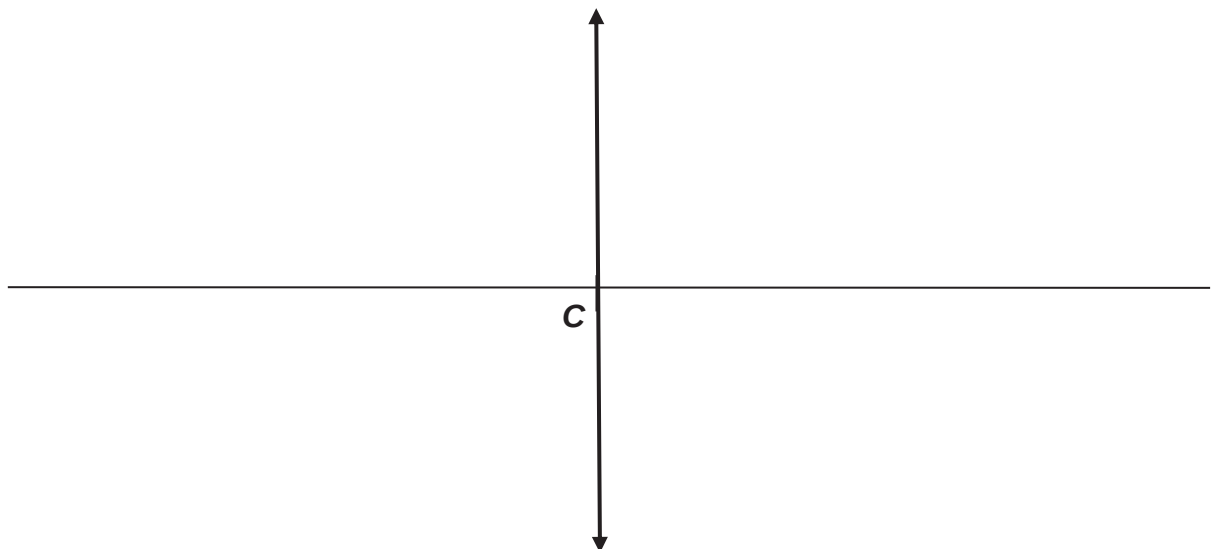
- (iv) Calculate the critical angle for the piece of glass prism.

critical angle = [1]

- (b) (i) An object **O** of height 2 cm is placed 2 cm on the left side of a convex lens of focal length 6 cm. Use the letter **F** to indicate the principal focus of the lens.

The principal axis and position of the convex lens with optical centre **C** have been drawn for you.

In the space below, use a 1:1 scale drawing to construct a ray diagram to locate the position of the image **I**. [3]



- (ii) Describe how the image **I** will change when the object is shifted another 1 cm away from the convex lens.

.....
 [1]

- 11 (a) Fig. 11.1 represents an electrical circuit containing a battery, ammeters A_1 and A_2 of negligible resistances, and three resistors.

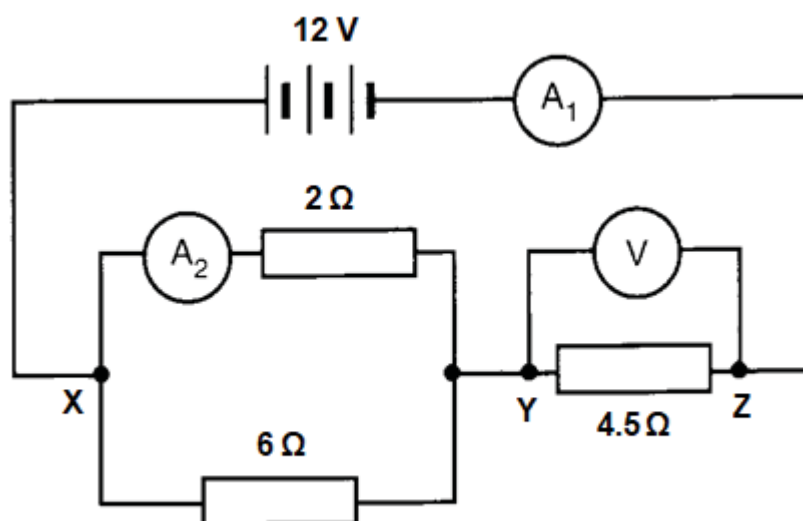


Fig. 11.1

- (i) Calculate the resistance between X and Y .

resistance between X and Y = [1]

- (ii) Calculate the resistance of the circuit between X and Z .

resistance between X and Z = [1]

- (iii) If the battery has negligible internal resistance, what will be the readings of the voltmeter **V** and ammeters **A₁** and **A₂**?

reading of voltmeter **V** = [1]

reading of ammeter **A₁** = [1]

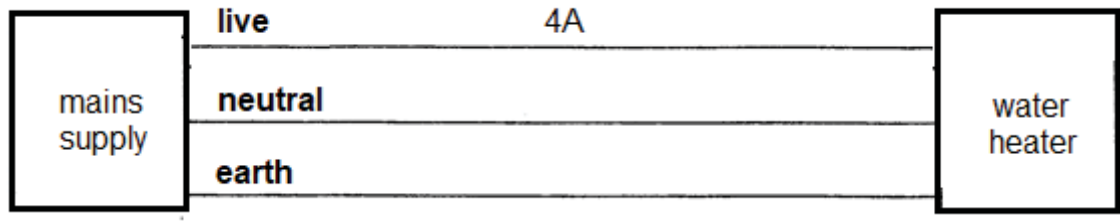
reading of ammeter **A₂** = [1]

- (iv) A wire of negligible resistance is connected across **X** and **Y**, what will be the readings of ammeters **A₁** and **A₂**?

reading of ammeter **A₁** = [1]

reading of ammeter **A₂** = [1]

- (b) The diagram shows the three wires of an electrical mains supply connected to a water heater. The live wire carries a current of 4 A.



- (i) If water heater is operating properly, what will be the size of the currents in the neutral and earth wires?

current in neutral wire = A, and

current in earth wire = A [1]

- (ii) Describe the electrical fault which the earth wire is protecting against.

.....
 [1]

- (iii) Hence describe how the earth wire work to protect against the electrical fault in your answer to (ii).

.....

 [1]

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