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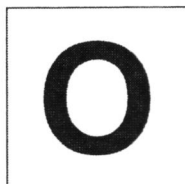
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SEMBAWANG SECONDARY SCHOOL
Mid-Year Examination 2019
SECONDARY TWO EXPRESS



CANDIDATE
NAME

CLASS:

INDEX
NUMBER

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SCIENCE

15 May 2019
1 hour 30 minutes
0800 – 0930h

Additional Materials: Multiple Choice Answer Sheet

READ THESE INSTRUCTIONS FIRST

Write your name, class and index number on the cover page.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.

Section A

There are **thirty** questions on this paper. Answer **all** questions. For each question, there are four possible answers **A, B, C** or **D**.
Choose the **one** you consider correct and record your choice in **soft pencil** on the separate Answer Sheet.

Read the instructions on the Answer Sheet very carefully.

Each correct answer will score one mark. A mark will not be deducted for a wrong answer.
Any rough working should be done in this booklet.

Section B and C

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

At the end of the examination, submit the multiple choice answer sheet and answers to section B and C separately.
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	
Section C	
TOTAL	70

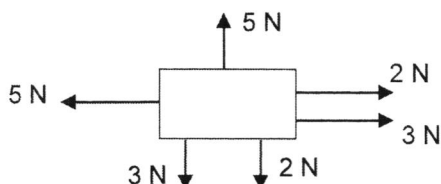
Section A

Answer **all** questions and record your choice on the separate Answer Sheet.

- 1 Which of the following is **not** possible when a force acts on an object?

A The object slows down.
 B The object moves faster.
 C The object changes its mass.
 D The object changes its shape.

- 2 A stationary object is subjected to the forces as shown in the diagram below.



What is the magnitude and the direction of the resultant force?

- A 5 N to the right
 B 5 N downward
 C 0 N to the right
 D 0 N and not moving
- 3 The gravitational field strength on Earth is 10 N/kg while on the moon, it is 1.6 N/kg.

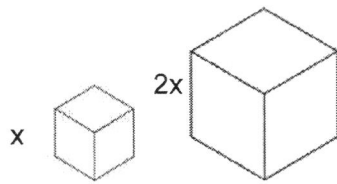
An object has a weight of 10 N on Earth. Which of the following shows the mass and weight of the object on the moon?

	mass on the moon	weight on the moon
A	1 kg	1.6 N
B	1 kg	10 N
C	1.6 kg	1.6 N
D	1.6 kg	10 N

- 4 Which statement about pressure is **not** true?

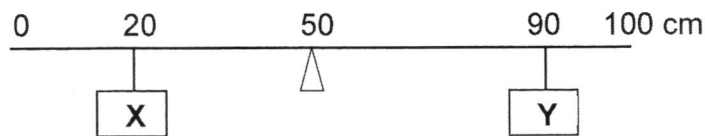
A A 20 N iron bar always exerts the same amount of pressure as a 20 N stone when resting on a floor.
 B The sharp edge of a knife exerts more pressure than a dull edge of a knife when the same amount of force is applied on them.
 C A lady wearing a pair of high-heel shoes exerts more pressure on the floor than wearing a pair of sport shoes.
 D Skis with a larger surface area enables the skier to slide on the ground easily.

- 5 The diagram shows two cubes made out of the same material. One cube has sides that are twice as long as the other cube. The weight of the smaller block is W while the weight of the larger block is $8W$.

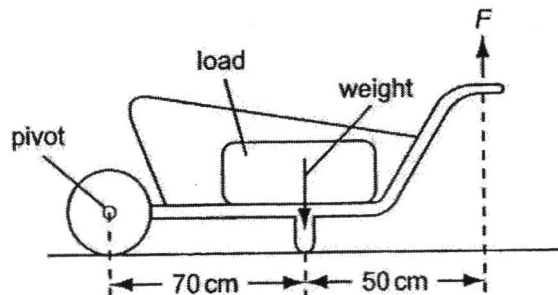


Which statement is true about the pressure exerted by the cubes on the floor?

- A The pressure exerted by the smaller cube is half the pressure exerted by the larger cube.
 B The pressure exerted by the smaller cube is twice the pressure exerted by the larger cube.
 C The pressure exerted by the smaller cube is equal the pressure exerted by the larger cube.
 D The pressure exerted by the smaller cube is eight times the pressure exerted by the larger cube.
- 6 A uniform metre rule is balanced at its centre of gravity as shown in the diagram. When masses **X** and **Y** are hung from position indicated, the ruler remained balanced. What can be concluded about masses **X** and **Y**?



- A **X** and **Y** have the same mass.
 B **X** has a greater mass than **Y**.
 C **X** has a smaller mass than **Y**.
 D **X** has a mass doubled that of **Y**.
- 7 A load is to be moved using a wheelbarrow. The total weight of the load and wheelbarrow is 600 N.

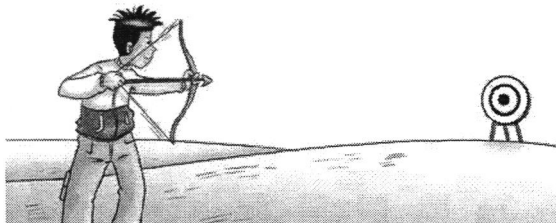


What is the size of force **F** needed just to lift the loaded wheelbarrow?

- A 350 N
 B 430 N
 C 600 N
 D 840 N

- 8 A toy car of mass 2.0 kg which is moving at a constant speed has 100 J of kinetic energy. What is its speed?
- A 7 m/s
 - B 10 m/s
 - C 50 m/s
 - D 100 m/s

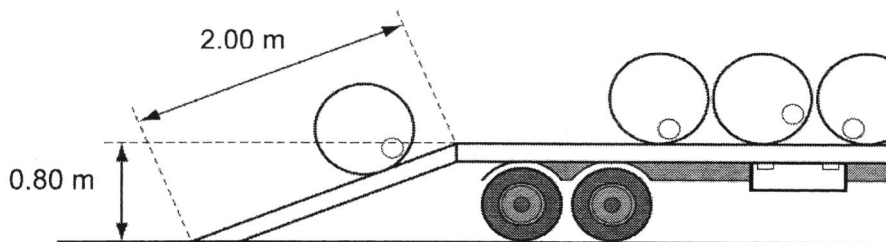
For questions 9 and 10, refer to the following diagram that shows Isaac drawing his bow to shoot the target.



- 9 Which of the following energy conversions occurs when Isaac draws his bow?
- A elastic potential energy $\rightarrow$ kinetic energy
 - B kinetic energy $\rightarrow$ elastic potential energy $\rightarrow$ sound + heat
 - C kinetic energy $\rightarrow$ elastic potential energy $\rightarrow$ kinetic energy
 - D chemical potential energy $\rightarrow$ kinetic energy $\rightarrow$ elastic potential energy
- 10 The following energy conversion takes place when a person does archery:
- elastic potential energy $\rightarrow$ kinetic energy

Which of the following actions involves such energy conversion?

- A drawing the bow
 - B aiming the target
 - C hitting the target
 - D releasing the arrow
- 11 A workman rolls a barrel of weight 2000 N up a plank of length 2.00 m and on to a lorry. The back of the lorry is 0.80 m above the horizontal surface of the road.



What is the work done on the barrel against gravity?

- A 1000 J
- B 1600 J
- C 2500 J
- D 4000 J

12 How many of the following sources of energy are renewable energy?

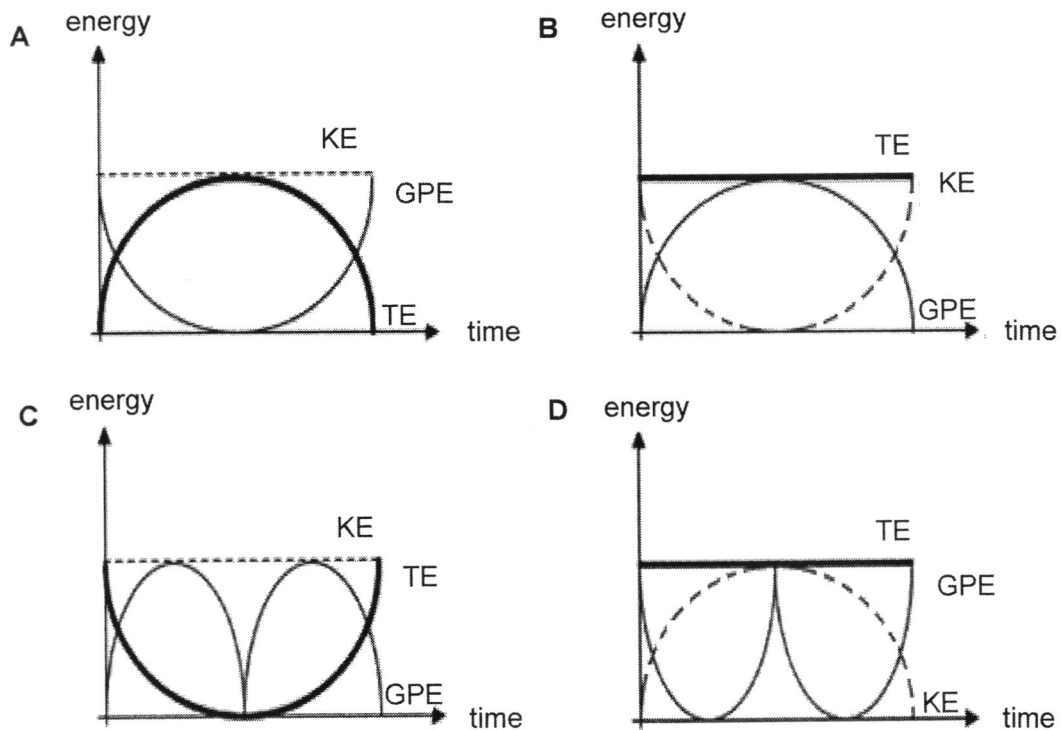
- I geothermal energy
- II nuclear energy
- III hydroelectric energy
- IV solar energy

- A 1
- B 2
- C 3
- D 4

13 A ball is thrown vertically upwards and allowed to fall as shown.



Which of the following graphs correctly show the variation of its gravitational potential energy (GPE —), kinetic energy (KE — —) and total energy (TE —) with time?



- 14 What happens to the kinetic energy of a moving object when its speed is doubled?

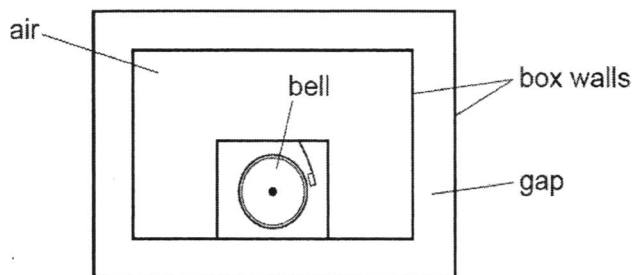
A halved
 B remains the same
 C doubled
 D increase by 4 times

- 15 A hearing aid attached to the ear helps people who suffer from hearing loss.

What is the function of the hearing aid?

A to increase the loudness of the sound from the surroundings
 B to increase the frequency of the sound from the surroundings
 C to decrease the frequency of the sound from the surroundings
 D to decrease the loudness of the sound from the surroundings

- 16 The diagram below shows an electric bell enclosed in a box.



When the electric bell is switched on, the sound generated could not be heard.

What could be in the gap?

A foam
 B oxygen
 C vacuum
 D mercury

- 17 A tuning fork when struck by a small force produces a frequency of 2000 Hz and a loudness of 80 dB. The tuning fork is then struck with a smaller force.

What will the final frequency and loudness of the sound produced be?

	frequency	loudness
A	1500 Hz	40 dB
B	1500 Hz	80 dB
C	2000 Hz	40 dB
D	2000 Hz	80 dB

- 18 The table below shows the densities of three different media.

medium	density (g/cm^3)
X	150
Y	8000
Z	1000

Which sequence shows the increasing order of the speed of sound in the three media?

- A X, Y, Z
- B X, Z, Y
- C Z, Y, X
- D Z, X, Y

- 19 A sound is played on a flute. A sound of a higher pitch is played on a trumpet.

Which of the following correctly compares the two sounds?

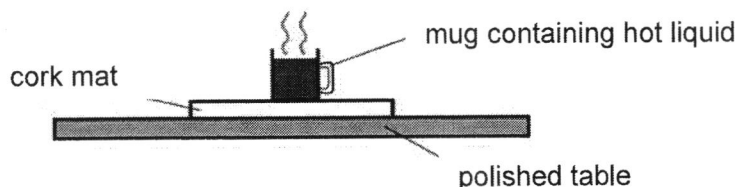
	frequency of sound produced by trumpet	speed of sound produced by trumpet
A	higher	same
B	lower	higher
C	higher	lower
D	same	same

- 20 Which of the following are uses of ultrasound?

- I cure tuberculosis
- II observe foetuses in pregnant mothers
- III observe tumours within the body
- IV observe abnormalities within the heart

- A I, II and III only
- B I, II and IV only
- C II, III and IV only
- D All of the above

- 21 To protect a polished table from being burnt, a cork mat may be placed on the table underneath a mug containing hot liquid.



Which of the following explains the effectiveness of the cork mat?

- A Cork is a good conductor of heat.
- B Cork is a good reflector of heat.
- C Cork is a good insulator of heat.
- D Cork is a good radiator of heat.

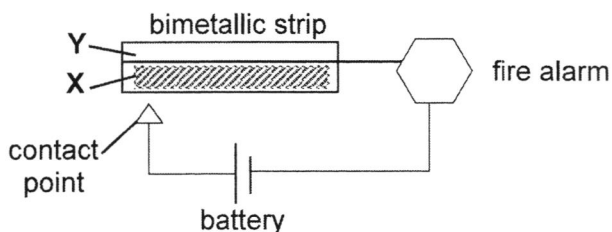
- 22 Which temperature conversion is correct?

	temperature / °C	temperature / K
A	-173	100
B	0	-273
C	100	273
D	273	0

- 23 A silver spoon and a plastic spoon are placed on a table in a room. Which explains why the silver spoon feels colder to the touch?

- A Silver is a better reflector of heat than plastic.
 B Silver is a better radiator of heat than plastic.
 C Silver is a better insulator of heat than plastic.
 D Silver is a better conductor of heat than plastic.

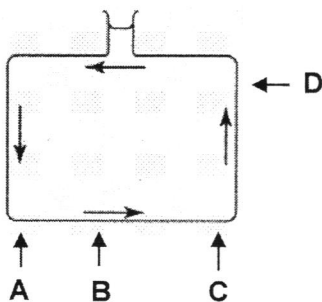
- 24 The diagram shows a model of an automatic fire alarm.



Which statement is true?

- A Metal X does not expand when heated.
 B Metal X is a poor conductor of heat.
 C Electric current flows faster in metal Y.
 D Metal Y expands more than metal X.

- 25 Where should a flame be placed so that convection current will flow in the direction as shown?



- 26 Which statement does **not** describe a chemical change?

- A A salt solution evaporated to form dry salt upon heating.
 B Electricity is used to split water into oxygen and hydrogen gas.
 C Plants take in carbon dioxide and water to produce glucose and oxygen.
 D Raw sugar turned brown then black upon heating.

- 27 The table below shows the pH of various liquids. Which of these liquids, when added to magnesium ribbon will give off hydrogen gas?

liquid	pH value
A	2
B	7
C	8
D	14

- 28 Which of the following reactions is a thermal decomposition process?

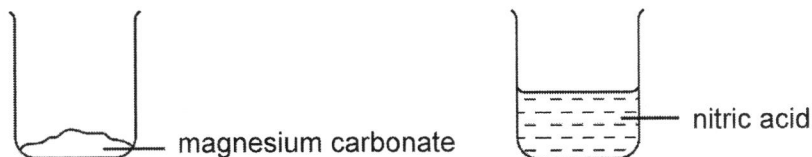
- A carbon dioxide + water $\rightarrow$ glucose + oxygen
- B lead(II) carbonate $\rightarrow$ carbon dioxide + lead(II) oxide
- C magnesium + oxygen $\rightarrow$ magnesium oxide
- D nitric acid + sodium hydroxide $\rightarrow$ sodium nitrate + water

- 29 Flowers of a hydrangea bush are blue when grown in acidic soils and pink when the soil is alkaline.

Which substance is added to the soil of a hydrangea with blue flowers so that it produces pink flowers?

- A citric acid
- B calcium hydroxide
- C copper(II) sulfate
- D sodium chloride

- 30 The contents of the labelled beakers shown are mixed.



What is the salt formed from the mixture of magnesium carbonate and nitric acid?

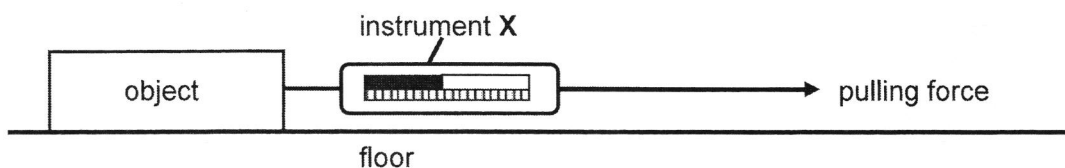
- A nitric carbonate
- B nitric magnesium
- C magnesium nitrate
- D magnesium nitric

End of Section A

Section B

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

- 31 (a) The diagram below shows an experiment to measure the friction between the object and the surface of a floor.

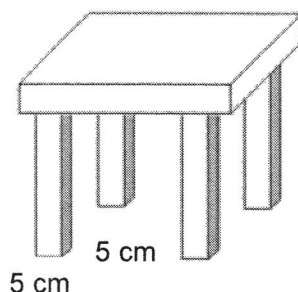


- (i) State the name of instrument X.

..... [1]

- (ii) On the diagram, draw an arrow to indicate the direction of the frictional force acting on the object. [1]

- (b) The figure below shows a stool. Each leg of the stool has a square base of side 5 cm.



- (i) Define pressure.

..... [1]

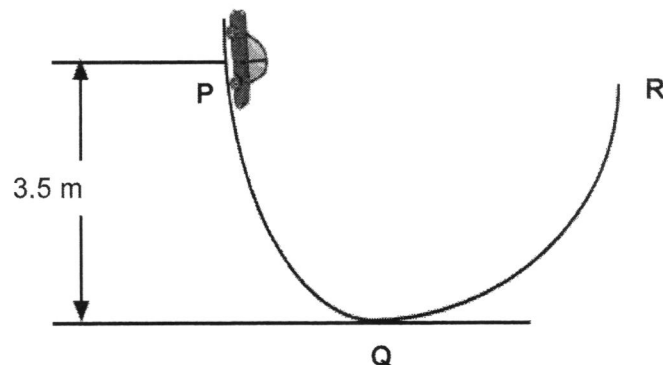
- (ii) Find the pressure exerted on the floor if the weight of the stool is 6 N.

pressure = [2]

- (iii) A boy who weighs 300 N sat on the stool. Find the pressure exerted on the floor now.

pressure = [2]

- 32 The figure below shows a toy car of weight 2 N moving down a rough track.



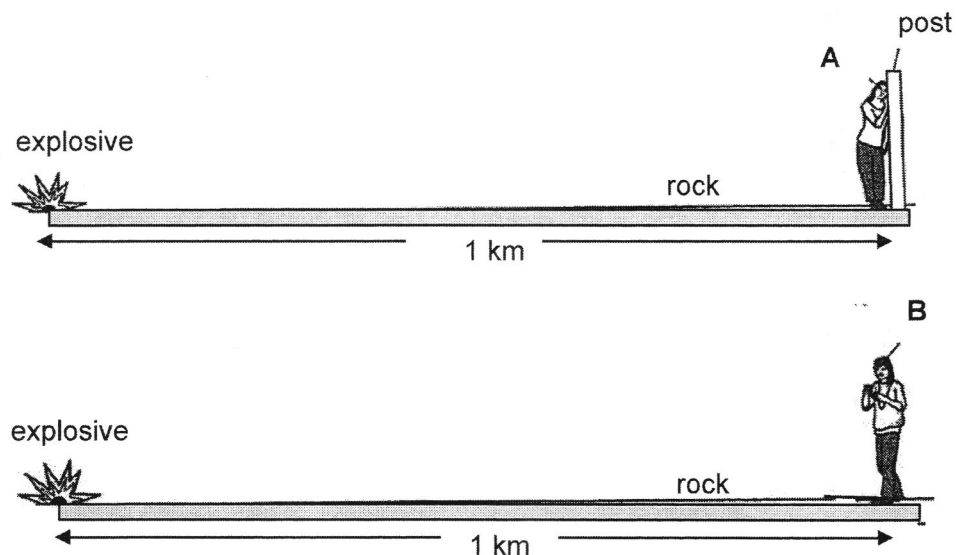
- (a) State the Law of Conservation of Energy.

 [1]
- (b) State the energy conversion from point P to point Q.
 [1]
- (c) Given that points P and R are at the same height, predict if the toy car will be able to reach point R. Suggest a reason for this.

 [2]
- (d) On the figure above, draw an arrow to indicate the weight of the toy car. [1]
- (e) Define the term energy.
 [1]
- (f) Calculate the gravitation potential energy of the toy car at point P.

gravitational potential energy = [1]

- 33 (a) Two students, **A** and **B**, conduct an experiment to compare the time taken for sound to travel through rock and through air. They stand at an equal distance from a small explosive placed in the ground as shown in the diagrams below.



The distance between the explosive and the students is 1 km. When the explosive is set off, each student starts her timer when she sees the flash and stops the timer when she hears the bang.

Student **A** detects the sound that travels through the rock by putting her ear against a post that is stuck onto the surface of the rock. Student **B** detects the sound that has travelled through the air.

- (i) Which student, **A** or **B**, detects the sound first?

..... [1]

- (ii) Give a reason for your answer in (a)(i).

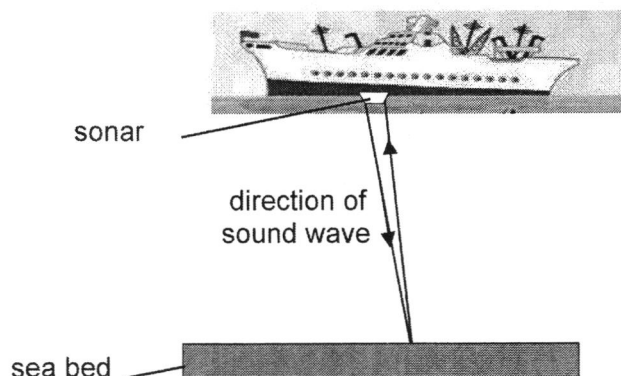
..... [1]

- (iii) Using the Particulate Theory of Matter, explain why there is a difference in the timing for students **A** and **B**.

.....

 [2]

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



- (i) What is the name for the reflection of sound?

..... [1]

- (ii) 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 1.8 s.

Calculate the depth of the sea.

[1]

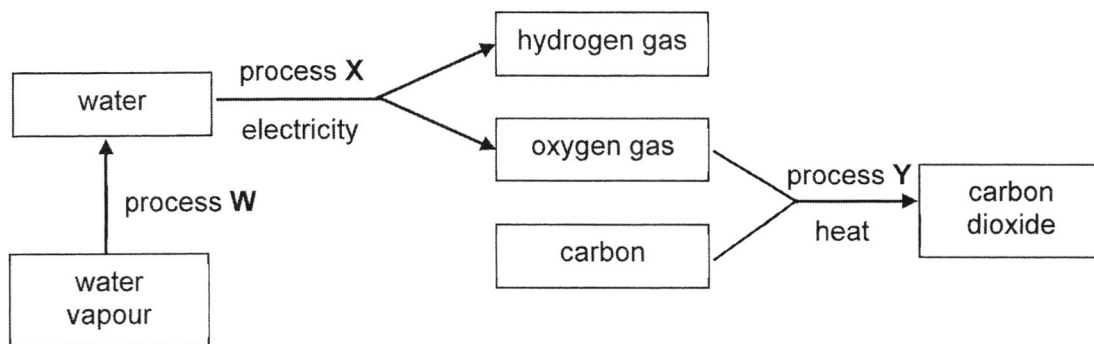
- (iii) After 30 s, the transmitter sends another sound wave to the sea again. Two sound waves are detected, one of it is detected 1.0 s later and another is detected 1.8 s later.

State a possible cause for the first sound to be detected.

.....

..... [1]

- 34 (a) The figure shows how some substances undergo a series of changes.



- (i) Complete the table below.

process	name of process	chemical / physical change
W		
X		
Y		chemical

[5]

- (ii) Explain why process Y is a chemical process.

.....
 [1]

- (b) Acids can undergo many reactions. A student decides to investigate the different reactions of acid. She puts a few drops of Universal Indicator and hydrochloric acid in a beaker. Next, she added potassium hydroxide and swirled the beaker.

- (i) State the colour change the student will observe before and after adding potassium hydroxide.

..... [1]

- (ii) Write the word equation for this reaction.

.....
 [1]

- (iii) Suggest another substance, other than an alkali, that the student can add to react with acid.

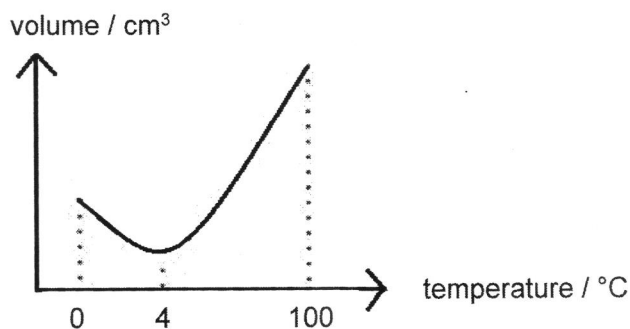
..... [1]

End of Section B

Section C

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

- 35 (a) The graph below shows how the volume of a fixed mass of water changes as it is heated from 0°C to 100°C .

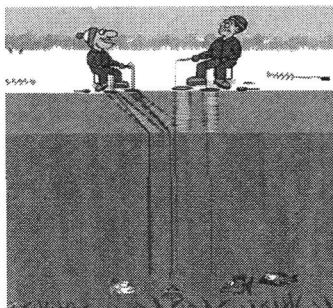


- (i) Using the graph above, describe how the density of water changes as it is heated from 0°C to 100°C .

.....

 [2]

- (ii) In Finland, during the winter, the weather gets so cold that the surface of lakes start to freeze. However, the fishes that live in the lake are able to survive. The temperature of the water just below the ice is about 0°C while the water at the bottom remains at about 4°C .

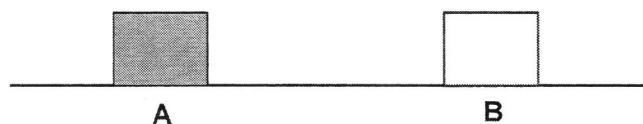


Using ideas about density and heat transfer, explain the scenario mentioned above.

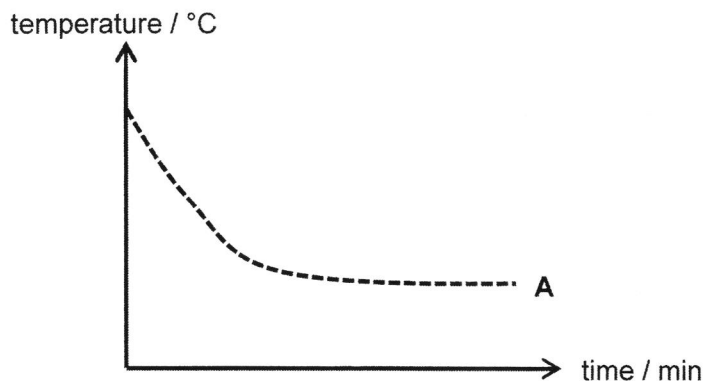
.....

 [3]

- (b) The diagram below shows two containers of the same size and material, containing equal volumes of water at 95 °C. Container **A** is painted black while container **B** is painted white.



The temperature - time graph for the water in container **A** is shown in the graph below.



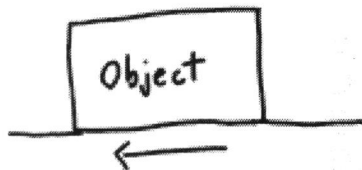
- (i) Explain why the temperature of the water reaches a steady temperature after a while.
 [1]
- (ii) Draw on the graph above, the possible curve for the temperature data taken for the water in container **B** and label it "B". [1]
- (iii) Explain the reason for the graph that you have drawn for part (b)(ii).

 [2]
- (iv) Give an application where black surfaces are used for being a good absorber of heat.
 [1]

-- End of Paper --

- | | | |
|-------|-------|-------|
| 1. C | 11. B | 21. C |
| 2. D | 12. D | 22. A |
| 3. A | 13. B | 23. D |
| 4. A | 14. D | 24. D |
| 5. A | 15. A | 25. C |
| 6. B | 16. C | 26. A |
| 7. A | 17. C | 27. A |
| 8. D | 18. B | 28. B |
| 9. D | 19. A | 29. B |
| 10. D | 20. C | 30. C |

31 (a)(i) spring balance



(b) (i) Pressure is the force acting per unit area.

(ii)

$$\begin{aligned}
 P &= \frac{F}{A} \\
 &= \frac{6 \text{ N}}{(5 \times 5 \times 4) \text{ cm}^2} \\
 &= 0.06 \text{ N/cm}^2 //
 \end{aligned}$$

(iii)

$$\begin{aligned}
 P &= \frac{F}{A} \\
 &= \frac{(6 + 300) \text{ N}}{(5 \times 5 \times 4) \text{ cm}^2} \\
 &= 3.06 \text{ N/cm}^2 //
 \end{aligned}$$

32 (a) The Law of Conservation of Energy states that energy cannot be created; energy can only be converted from one form to another, or transferred from one body to another. The total energy in the whole system remains constant.

(b) Gravitational potential energy $\longrightarrow$ kinetic energy + heat energy

(c) No, it will not reach R.

The kinetic energy of the car at Q will be lower than the gravitational potential energy of the car at P, as some of the car's gravitational potential energy is lost as heat energy to the surroundings due to friction.

With a lower kinetic energy at Q, the amount of kinetic energy converted to gravitational potential energy will also be lower. Hence, when the car reached its highest point along QR, when kinetic energy of the car is 0J, its gravitational potential energy will not be as high as at P, so its position will be lower than R.

(d)



(e) Energy is the ability to do work.

(f)

$$\begin{aligned} \text{GPE at P} &= mgh \\ &= 2 \times 3.5 \\ &= 7 \text{ J} // \end{aligned}$$

33 (a) (i) Student A

(ii) Sound waves travel faster through rock than air, so the sound waves will reach A first.

(iii) When the explosives are set off, it cause the surrounding rock particles and air particles to vibrate parallel to the direction of the sound waves. The vibrations are passed on from one particle to the next, transmitting the sound waves through the medium.

The vibrations can be transmitted much faster through the rocks as the rock particles are packed tightly together, while the vibrations are transmitted much slower through the air as the air particles are far apart.

33 (b) (i) It is called an echo.

(ii)

$$\text{depth of sea} \times 2 = \text{Speed} \times \text{Time}$$

$$\text{depth of sea} = \frac{1500 \times 1.8}{2}$$

$$= 1350 \text{ m} //$$

(iii) The first sound detected by the receiver comes from a reflection off something in between the ship and the sea bed, most likely from a shoal of fish swimming underneath the ship.

- 34 (a) (i) W: condensation; physical change
X: electrolysis; chemical change
Y: combination / oxidation / combustion

(ii) New products are formed.

(b) (i) Red to green / Red to violet

(ii) hydrochloric acid + potassium hydroxide $\rightarrow$ potassium chloride + water

(iii) potassium carbonate

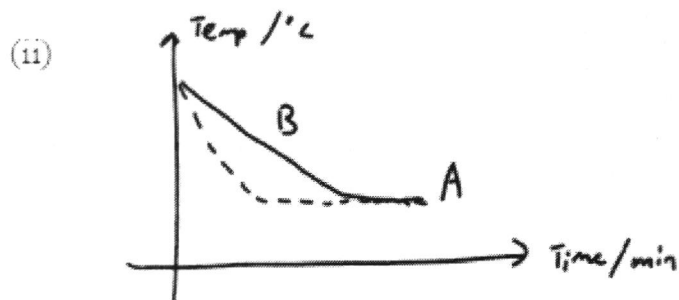
35 (a) (i) As the temperature of the water increases from 0 deg C to 4 deg C, the volume of water decreases, causing the density of water to increase, reaching the highest density at 4 deg C.

As the temperature of the water increases from 4 deg C to 100 deg C, the volume of water increases, causing the density of water to decrease.

(ii) The density of ice and water at 0 deg C is lower than the density of the water at 4 deg C, so the ice floats on top of the water.

The water near the ice lose heat to the ice, and their temperature remains close to 0 deg C. The water near the ice have lower density than the density of the water below it at 4 deg C, so the less dense water remains at the top, while the denser water remains at the bottom, no convection current is set up. The water at the bottom do not lose heat and freeze.

(b)(i) The net transfer of heat energy between the container and surroundings has become zero,



(iii) White colored surfaces are poorer emitter of radiant heat than black colored surfaces.
Since B is painted white, while A is painted black, B loses heat at a slower rate than A, so its temperature decreases at a slower rate.

(iv) Heating panel of a solar water heater