Index Number: _______________ SEC24/1.19s

L-Università ta' Malta

MATRICULATION AND SECONDARY EDUCATION CERTIFICATE EXAMINATIONS BOARD

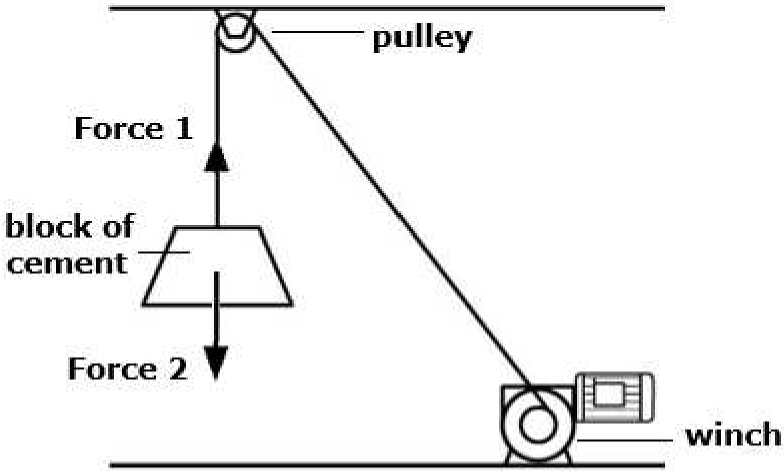
**SECONDARY EDUCATION CERTIFICATE LEVEL**
**2019 SUPPLEMENTARY SESSION**

| | |
|---|---|
| SUBJECT: | **Physics** |
| PAPER NUMBER: | I |
| DATE: | 29th August 2019 |
| TIME: | 9:00 a.m. to 11:05 a.m. |

**Answer ALL questions.**
**You are requested to show your working and to write the units where necessary.**
**When necessary, take g, acceleration due to gravity, as 10 m/s$^2$.**

| | | | |
|---|---|---|---|
| **Density** | $m = \rho V$ | | |
| **Pressure** | $F = p A$ | $p = \rho g h$ | |
| **Moments** | Moment = F × perpendicular distance | | |
| **Energy and Work** | $PE = m g h$ | $KE = \frac{1}{2} m v^2$ | $W = F s$ |
| | Work Done=energy converted | | $E = p t$ |
| **Force and Motion** | $m a$ = unbalanced force | $W = m g$ | $v = u + a t$ |
| | average speed $= \frac{\text{total distance}}{\text{total time}}$ | | $s = (u + v)\frac{t}{2}$ |
| | $v^2 = u^2 + 2 a s$ | $s = u t + \frac{1}{2} a t^2$ | momentum = m v |
| **Waves** | $\eta = \frac{\text{speed of light in air}}{\text{speed of light in medium}}$ | | $v = f\lambda$ |
| | $\eta = \frac{\text{real depth}}{\text{apparent depth}}$ | Magnification $= \frac{\text{image distance}}{\text{object distance}}$ | |
| | Magnification $= \frac{\text{image height}}{\text{object height}}$ | | $T = \frac{1}{f}$ |
| **Electricity** | $Q = I t$ | $V = I R$ | $E = Q V$ |
| | $P = I V$ | $R \propto \frac{L}{A}$ | $E = I V t$ |
| | $R_{total} = R_1 + R_2 + R_3$ | $\frac{1}{R_{total}} = \frac{1}{R_1} + \frac{1}{R_2}$ | |
| **Electromagnetism** | $\frac{V_p}{V_s} = \frac{N_p}{N_s}$ | $V_p I_p = V_s I_s$ | |
| **Heat** | $Q = m c \Delta\theta$ | | |
| **Radioactivity** | $A = Z + N$ | | |
| **Other equations** | Area of a triangle $= \frac{1}{2}$ b h | Area of a trapezium $= \frac{1}{2}$ (a + b) h | |
| | Area of a circle $= \pi r^2$ | | |

1. The diagram shows a winch being used to lift a block full of cement off the ground. The block accelerates upwards for a brief time and then it continues to rise at a constant speed of 15 metres per minute. The mass of the block and cement is 30 kg.




a. Name the **TWO** forces acting on the block.

Force 1 ____________________ (1)

Force 2 ____________________ (1)

b. Calculate the constant speed of the block in m/s.

____________________

____________________ (2)

c. Comment on the size of these two forces during the initial brief acceleration upwards.

____________________ (1)

d. Comment on the size of these forces when the block moves at a constant speed.

____________________ (1)

e. Calculate the unbalanced force required if the initial acceleration of the block is 2.5 $m/s^2$.

____________________

____________________ (2)

f. Calculate the upward force required to give the acceleration mentioned in part (e).

____________________

____________________ (2)

**(Total: 10 marks)**

10

2. The only seven heavenly bodies in our solar system visible in the sky up to the 17th century were the sun and the moon and the planets Mercury, Venus, Mars, Jupiter and Saturn.

*(https://blendermarket.com)*

a. In 1610, Galileo was looking through the telescope, and observed four moons orbiting the planet Jupiter.

i. What force keeps these moons orbiting around Jupiter?

______________________________ (1)

ii. Jupiter is the planet with the largest mass in our solar system. What effect does this have on the force mentioned in part (i)?

______________________________ (1)

iii. On what other factor, apart from mass, does this force depend?

______________________________ (1)

iv. Jupiter has the largest number of known moons, 79, amongst the planets in our solar system. Why is this so?

______________________________ (1)

v. Which are the other **TWO** planets in our solar system apart from Earth and the ones mentioned above?

______________________________ (2)

vi. Why are these two planets **not** normally visible with the naked eye?

______________________________ (1)

b. Up to about 50 years ago, images of the planets and other heavenly bodies could only be taken by telescopes based on earth, known as terrestrial telescopes. In the meantime, telescopes have been fitted to satellites orbiting the earth. These are known as space telescopes and can take exceptionally clear images of heavenly bodies.

i. Explain why space telescopes give clearer images than terrestrial ones.

______________________________ (1)

ii. How are the images taken by space telescopes sent to earth?

______________________________ (1)

iii. Why are photovoltaic (solar) cells used on satellites to provide power to the electrical and electronic equipment on board?

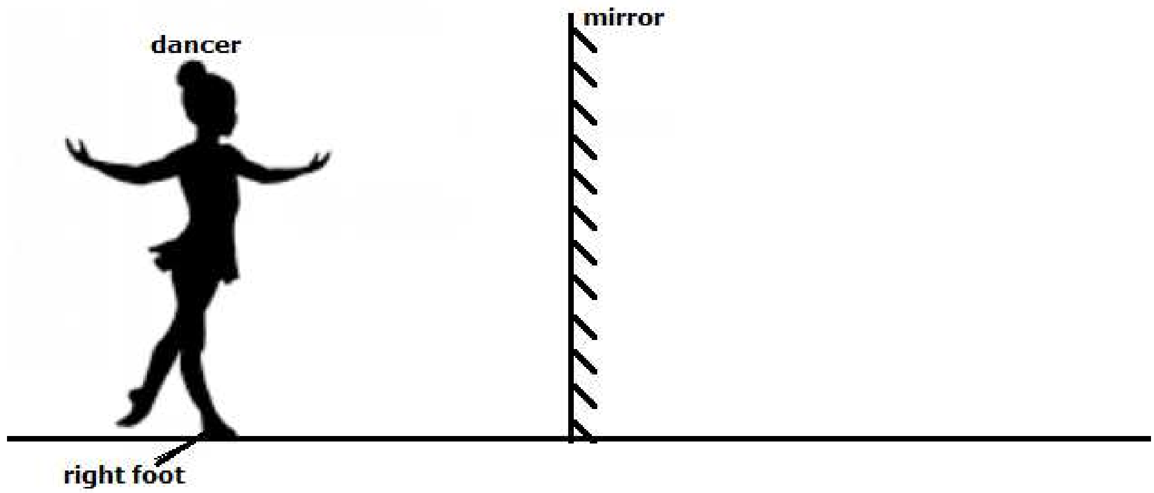
______________________________ (1)

**(Total: 10 marks)**

10

3. Dancers often stand in front of mirrors so that they can see their moves as they practice. The diagram shows a dancer in front of the mirror.

   a. Draw a ray to show how the dancer can see her right foot through the mirror. Include the path of the ray and the normal. (3)




   b. Mark with a cross (x) the position of the image of the dancer's right foot. (1)

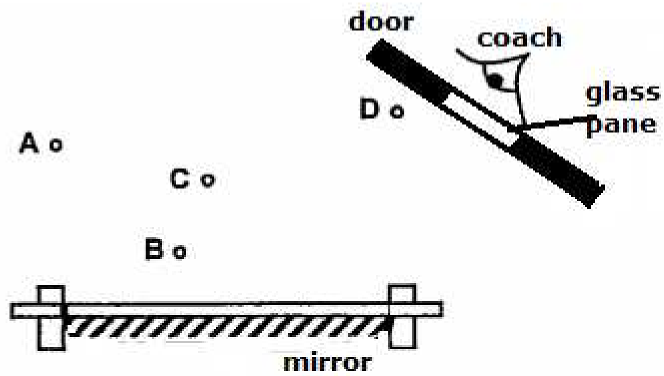
   c. The dancer notices that when she lifts her right foot, the image lifts the left foot. This is because the image is ____________________________. (1)

   d. Mention **TWO** other properties of the image observed in the mirror.

_______________________________________________________________________________

_______________________________________________________________________________(2)

   e. The coach observes four dancers, A,B,C and D, through the glass pane on the door of the dance studio.




      i. Which dancer cannot be seen by the coach? ____________________________ (1)

      ii. Explain why this dancer cannot be seen by the coach.

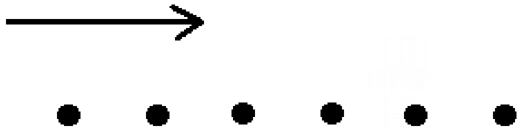
_______________________________________________________________________________

_______________________________________________________________________________ (2)

**(Total: 10 marks)**

10

4. The figure below shows particles on the surface of water. A wave moves from left to right.

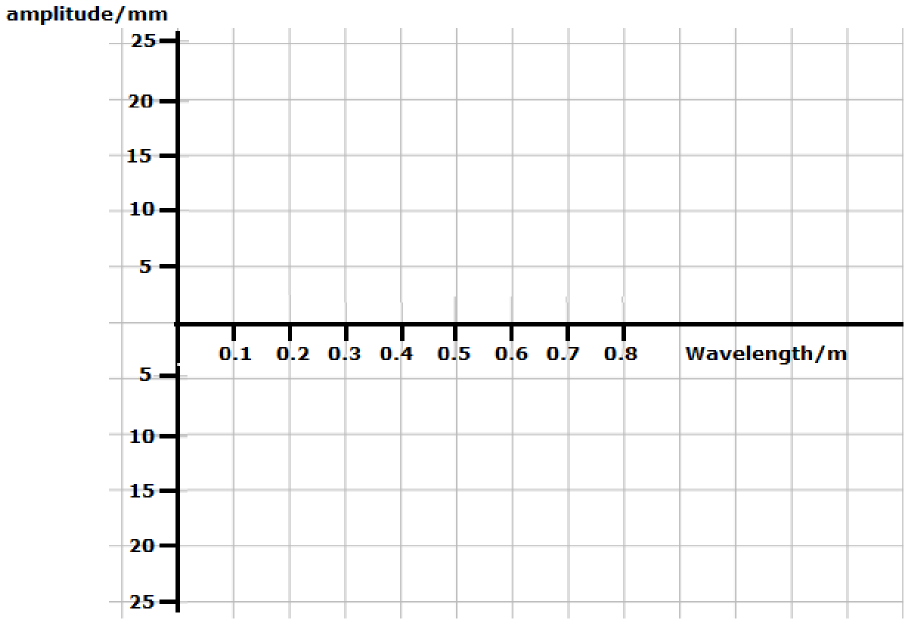


a. Explain the movement of each particle if the wave is a transverse wave.

______________________________________________________________________________

______________________________________________________________________________ (2)

b. On the graph below draw a transverse wave that has amplitude of 20 mm and a wavelength of 60 cm. (2)




c. The wave has a periodic time of $4 \times 10^{-4}$ s.

i. Find the frequency of the water wave.

______________________________________________________________________________

______________________________________________________________________________ (2)

ii. Calculate the speed of this wave.

______________________________________________________________________________

______________________________________________________________________________ (2)

d. The water wave enters a shallower region. Mention **TWO** changes that happen to the water wave as it enters the shallower part.

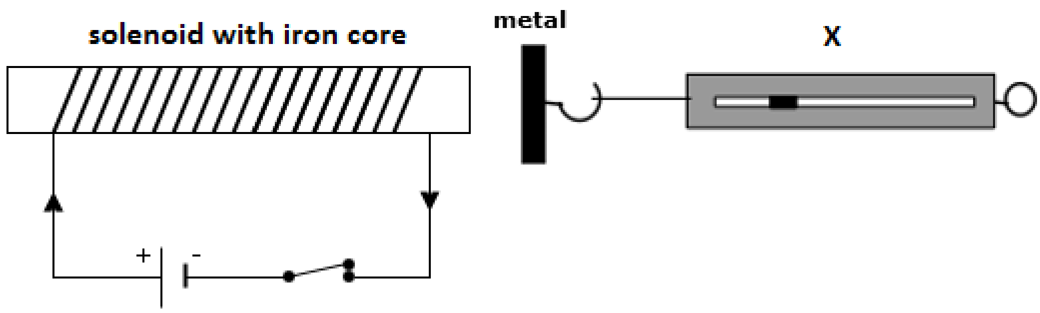
______________________________________________________________________________

______________________________________________________________________________ (2)

**(Total: 10 marks)**

10

5. William is investigating how the strength of a solenoid with an iron core varies with current.




a. What component must be added to the circuit to:
   i. vary the current?

______________________________________________________________________(1)

   ii. measure the current?

______________________________________________________________________(1)

b. Apparatus X in the above diagram is used to measure the force. State its name.

______________________________________________________________________(1)

William varies the current, each time measuring the force produced. The table with the results obtained is displayed below.

| | | | | | |
|---|---|---|---|---|---|
| Force F / N | 0 | 1.0 | 2.0 | 3.0 | 4.0 |
| Current I / A | 0 | 0.5 | 1.0 | 1.5 | 2.0 |

c. Plot a graph of the force F (y-axis) against current I (x-axis). (4)

d. From the graph it can be concluded that the Force and Current are:

______________________________________________________________________(1)

e. Use your graph to find the value of current that produces a force of 1.8 N.

______________________________________________________________________(1)

f. Apart from varying the current what changes could be made to the solenoid to provide a stronger attractive force?

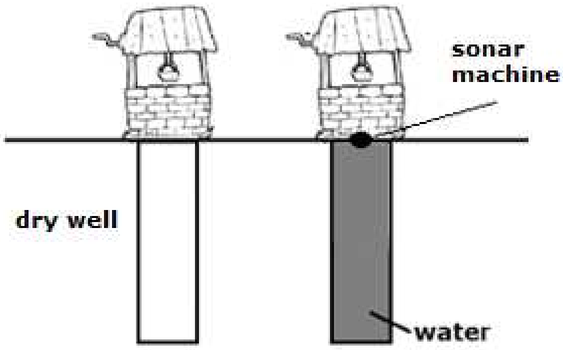
______________________________________________________________________(1)

**(Total: 10 marks)**

10

10

6. When a well is dry, a stone dropped from rest at the top takes 4 s to hit the bottom.




a. With what speed will the stone touch the bottom of the well?

______________________________________________________________________

______________________________________________________________________(2)

b. How deep is the well?

______________________________________________________________________

______________________________________________________________________(2)

c. A person at the top can tell when the stone hits the bottom by the sound it makes on impact. Calculate how long sound takes to reach the person on top, if sound travels at 320 m/s in air.

______________________________________________________________________

______________________________________________________________________(2)

d. Explain, using air particles, how sound waves travel from the bottom of the well towards the person on top. Include the name of this type of wave.

______________________________________________________________________

______________________________________________________________________(2)

e. When the well is full of water, audible sound is not used to find its depth. Instead an ultrasound pulse is sent from a sonar machine placed at the top.

i. What is ultra sound?

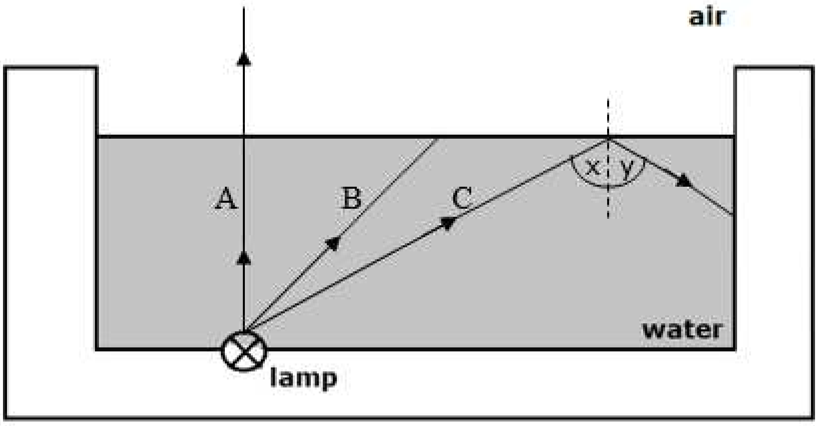
______________________________________________________________________(1)

ii. Underline the correct statement.
Ultra sound is preferred over normal sound since it:
- can pass through water but it is reflected by stone.
- is refracted by water and absorbed by stone.
- is diffracted by water and refracted by stone. (1)

**(Total: 10 marks)**

| |
|---|
| 10 |

7. A swimming pool is lit by a lamp at the bottom of the pool, 1.2 m deep. The directions of three rays of light from the lamp are shown.




a. Explain why ray A does not bend as it exits the water and travels in air.

______________________________________________________________(1)

b. State **ONE** change that occurs to the light wave as it exits the water.

______________________________________________________________(1)

c. Continue the path of ray B in air. (2)

d. Ray C goes through total internal reflection.

i. Give **ONE** condition necessary for this phenomenon to take place.

______________________________________________________________

______________________________________________________________(1)

ii. What is the name given to angle x and angle y above?

Angle x ______________________________ (1)

Angle y______________________________ (1)

iii. What can you say about angle x and angle y? ____________________ (1)

e. When a boy looks down at the lamp, he estimates it to be 90 cm below the surface of the water. Calculate the refractive index of water.

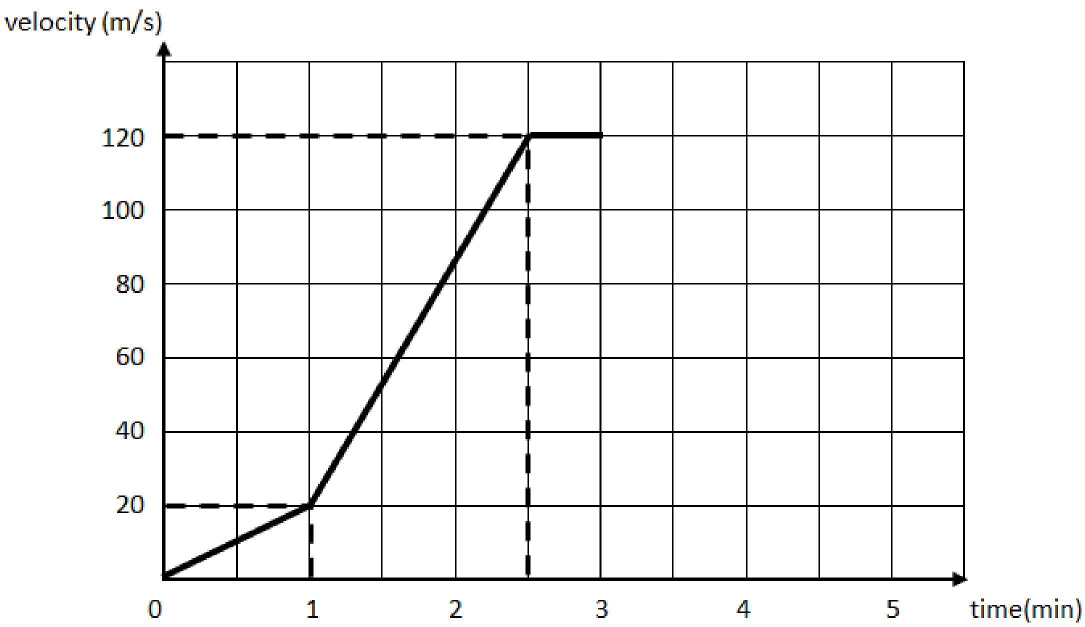
______________________________________________________________

______________________________________________________________(2)

**(Total: 10 marks)**

10

8. The velocity-time graph represents part of Emma's motorbike ride on a Sunday morning.




a. Calculate Emma's acceleration during the first minute of her journey.

______________________________________________________________

______________________________________________________________(2)

b. For how long did Emma travel at a constant speed? Give your answer in seconds.

______________________________________________________________(1)

c. i. State between which minutes Emma's acceleration was the highest.

______________________________________________________________(1)

ii. Hence, calculate the distance covered by Emma in this period.

______________________________________________________________

______________________________________________________________ (2)

d. After 3 minutes, Emma presses the brake pedal and slowly comes to rest. The motorbike decelerates at 1 $m/s^2$.

i. Calculate the time it took Emma to come to rest.

______________________________________________________________

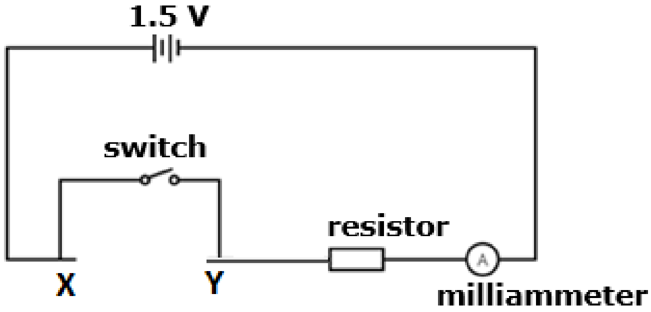
______________________________________________________________(2)

ii. Represent this deceleration on the graph above. (2)

**(Total: 10 marks)**

10

9. Photographers use a light sensor to check the light conditions when taking a photograph.




The circuit above shows how the light sensor is connected. The light sensor is a special type of resistor called L.D.R.

a. Draw the L.D.R. in the space provided between X and Y in the above circuit. (1)

b. What does L.D.R. stand for? ______________________________ (1)

c. Suggest another suitable use for the L.D.R.

______________________________(1)

d. Why is a milliammeter rather than an ammeter used in the circuit?

______________________________(1)

The switch is open and the milliammeter reads 0 mA when in the dark. While when there is a bright light the milliammeter reads 4 mA.

e. How does the resistance of the sensor change as it gets darker? Explain how you arrived at your conclusion.

______________________________

______________________________(2)

f. The switch is now closed.

i. Explain why the milliammeter will now give a reading of current even when in the dark.

______________________________(1)

ii. The milliammeter reads 5 mA. Convert 5 mA to Amps.

______________________________(1)

iii. Calculate the resistance of the fixed resistor.

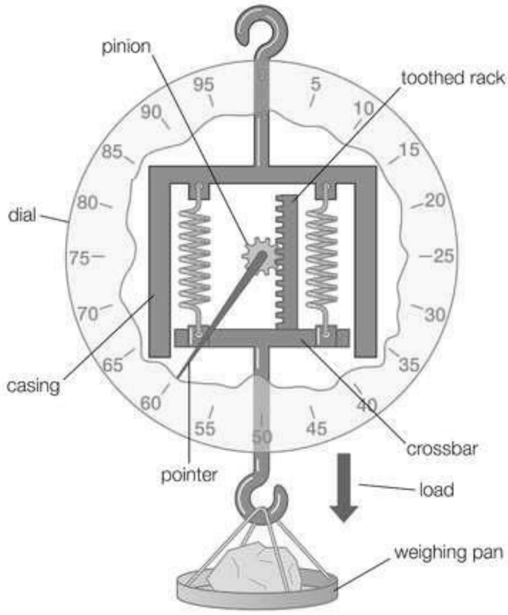
______________________________

______________________________(2)

**(Total: 10 marks)**

| |
|---|
| |
| 10 |

10. The diagram shows a weighing scales operating on the principle of the spring balance. The two springs hang from a fixed casing and their lower ends are attached to a crossbar. As weights are added to the pan, the springs extend, and the toothed rack moves down. This causes the pinion (a round wheel with toothed gears) to rotate and the pointer moves along the dial or scale. The scale is calibrated in Newtons and has a full-scale deflection of 100 N.




a. In which direction does the pointer move when weights are added to the pan?

_______________________________________ (1)

b. What is the maximum mass that can be placed on the pan to get full scale deflection?

_______________________________________

_______________________________________ (2)

c. Calculate the force in each spring at full scale deflection.

_______________________________________ (1)

d. This instrument is taken to different places on earth. It gives different readings when loaded with the same mass. It would also give different readings on other planets which have a different pull of gravity. In the following table mark with a ✓ whether the reading would be 0, less than or greater than the reading obtained on the surface of the earth. The pull of gravity of the two named planets is stated in brackets for each planet. (3)

| | 0 | less than | greater than |
|---|---|---|---|
| on top of a high mountain on earth | | | |
| on the surface of Jupiter (25 N/kg) | | | |
| on the surface of Mercury (3.7 N/kg) | | | |

e. If the instrument had to have four similar springs instead of two, what load would give full scale deflection of the instrument? Explain.

_______________________________________________________________

_______________________________________________________________ (2)

f. What is the advantage of having the pointer attached to this toothed gear system as shown?

_______________________________________________________________ (1)

**(Total: 10 marks)**

10

MATRICULATION AND SECONDARY EDUCATION CERTIFICATE EXAMINATIONS BOARD

L-Università ta' Malta

**SECONDARY EDUCATION CERTIFICATE LEVEL**
**2019 SUPPLEMENTARY SESSION**

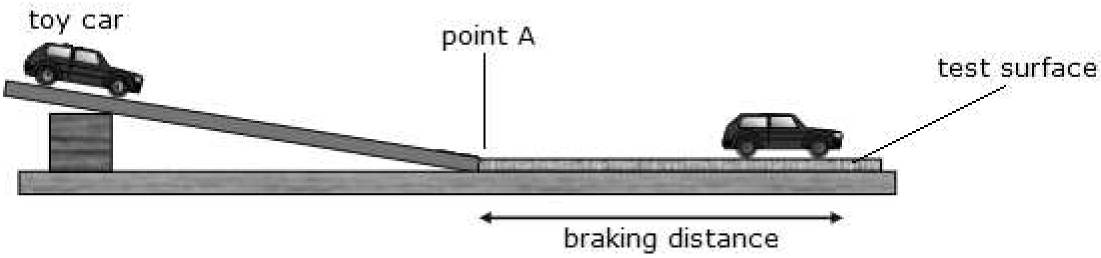
| | |
|---|---|
| SUBJECT: | **Physics** |
| PAPER NUMBER: | IIB |
| DATE: | 29th August 2019 |
| TIME: | 4:00 p.m. to 6:05 p.m. |

**Answer ALL questions.**
**You are requested to show your working and to write the units where necessary.**
**When necessary, take g, acceleration due to gravity, as 10m/s$^2$.**

| | | | |
|---|---|---|---|
| **Density** | $m = \rho V$ | | |
| **Pressure** | $F = p A$ | $p = \rho g h$ | |
| **Moments** | Moment = F × perpendicular distance | | |
| **Energy and Work** | $PE = m g h$ | $KE = \frac{1}{2} m v^2$ | $W = F s$ |
| | Work Done=energy converted | | $E = p t$ |
| **Force and Motion** | $m a$ = unbalanced force | $W = m g$ | $v = u + a t$ |
| | $\text{average speed} = \frac{\text{total distance}}{\text{total time}}$ | | $s = (u + v)\frac{t}{2}$ |
| | $v^2 = u^2 + 2 a s$ | $s = u t + \frac{1}{2} a t^2$ | momentum = m v |
| **Waves** | $\eta = \frac{\text{speed of light in air}}{\text{speed of light in medium}}$ | | $v = f\lambda$ |
| | $\eta = \frac{\text{real depth}}{\text{apparent depth}}$ | $\text{Magnification} = \frac{\text{image distance}}{\text{object distance}}$ | |
| | $\text{Magnification} = \frac{\text{image height}}{\text{object height}}$ | | $T = \frac{1}{f}$ |
| **Electricity** | $Q = I t$ | $V = I R$ | $E = Q V$ |
| | $P = I V$ | $R \propto \frac{L}{A}$ | $E = I V t$ |
| | $R_{total} = R_1 + R_2 + R_3$ | $\frac{1}{R_{total}} = \frac{1}{R_1} + \frac{1}{R_2}$ | |
| **Electromagnetism** | $\frac{V_p}{V_s} = \frac{N_p}{N_s}$ | $V_p I_p = V_s I_s$ | |
| **Heat** | $Q = m c \Delta\theta$ | | |
| **Radioactivity** | $A = Z + N$ | | |
| **Other equations** | Area of a triangle = $\frac{1}{2}$ b h | Area of a trapezium = $\frac{1}{2}$ (a + b) h | |
| | Area of a circle = $\pi r^2$ | | |

1. This question is about braking distances.

Martha and Matthew would like to investigate how different surfaces affect the braking distance of a toy car. They set up a ramp as shown in the diagram below.




They decide to test four different surfaces: turf, gravel, polished tiles and concrete.

a. Use numbers 1 to 5 to obtain the method in the correct sequence.

| | |
|---|---|
| This distance is labelled as braking distance and recorded in a table. | |
| The above steps are repeated for all the other test surfaces. | |
| The toy car is released from the top of the ramp and allowed to come to rest. | |
| The first test surface is placed next to the ramp. | |
| The distance between point A and the place where the car stops is measured. | |

(5)

b. Mention **TWO** important precautions that must be taken by Matthew and Martha to ensure that their test is fair.

______________________________________________________________________

______________________________________________________________________ (2)

c. i. Which surface would give the longest braking distance? Underline.

Turf Gravel Polished tiles Concrete

(1)

ii. Give a reason for your choice.

______________________________________________________________________

______________________________________________________________________ (2)

d. Martha attached a data logger at point A to record the velocity with which the car enters the test surface.

i. During one trial, the data logger gave a velocity of 0.5 m/s at point A. If the braking distance of the car was 0.05 m, calculate the deceleration of the car.

______________________________________________________________________

______________________________________________________________________(2)

ii. What was the braking time during this trial?

______________________________________________________________________

______________________________________________________________________(2)

iii. Martha made the ramp steeper such that the car passed through point A with a larger velocity. How will this affect the braking distance of the car?

______________________________________________________________________(1)

e. In practice, the stopping distance of a car does not consist only of the braking distance.

i. What name is given to the distance that the car travels before the driver puts his foot on the brake pedal? ____________________________ (1)

ii. Mention **ONE** factor that could increase the distance the car travels in this time.

______________________________________________________________________ (1)

iii. The braking distance for a car travelling at normal speeds is 22 m. If the total stopping distance of the car is 30 m, calculate how far the car travelled before the driver put his foot on the brake.

______________________________________________________________________ (1)

iv. If the driver took 0.4 s before he put his foot on the brake pedal, calculate the initial speed of the car before the braking.

______________________________________________________________________

______________________________________________________________________(2)

**(Total: 20 marks)**

| |
|---|
| |
| 20 |

2. This question is about pressure.

a. A footballer of mass 70 kg is wearing a pair of ordinary shoes. The total area of both shoes in contact with the ground is 0.04 $m^2$.

i. Define pressure.

______________________________________________________________ (1)

ii. Calculate the pressure he exerts on the ground when standing on both feet.

______________________________________________________________

______________________________________________________________ (2)

iii. This footballer then puts on a pair of football shoes, shown in the diagram on the right. Explain in terms of pressure why the several studs at the bottom of these shoes help to increase grip with the playing surface.

______________________________________________________________

______________________________________________________________ (2)

b. A sea diver is diving at a depth of 30 m in the sea.

i. Calculate the pressure that the sea water is exerting on him given that the density of sea water is 1025 $kg/m^3$.

______________________________________________________________

______________________________________________________________ (2)

ii. If atmospheric pressure on this day is 101 kPa, calculate the total pressure on the diver.

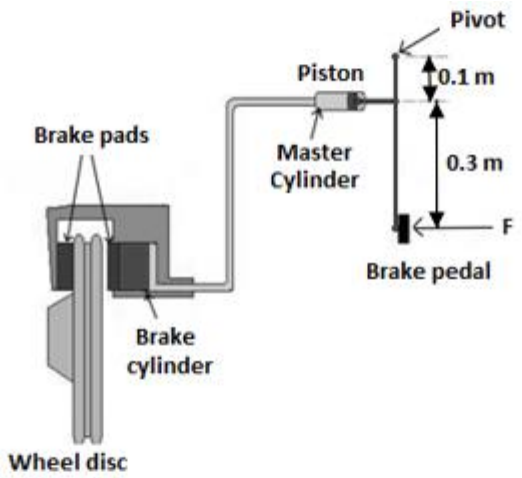
______________________________________________________________ (1)

iii. The air bubbles released by the diver at this depth are seen to increase in volume considerably while they are rising to the surface. Explain why this increase in volume occurs.

______________________________________________________________

______________________________________________________________ (2)

c. The diagram below shows a simplified view of the hydraulic brake system of a car. Only one wheel and one brake cylinder is shown for clarity. The brake pedal is pivoted at the top and acts as a lever. When a force is applied to the pedal as shown, the piston in the master cylinder is pressed inwards. The pressure exerted on the oil in the system forces the piston in the brake cylinder to move inwards. This action causes the brake pad to press against the wheel disc which in turn slows down the car.




*(adapted from https://defdriving.wordpress.com)*

i. A force F of 20 N is applied to the brake pedal. Use moments to calculate the force that this produces on the piston in the master cylinder.

______________________________________________________________________

______________________________________________________________________ (2)

ii. The area of the piston in the master cylinder is $4 \times 10^{-5}$ $m^2$. Calculate the pressure exerted on the oil by the piston in the master cylinder.

______________________________________________________________________

______________________________________________________________________ (2)

iii. What pressure is exerted by the oil on the piston in the brake cylinder?

______________________________________________________________________ (1)

iv. The area of the piston in the brake cylinder is $1.0 \times 10^{-4}$ $m^2$. Calculate the force that this piston exerts on this one brake pad.

______________________________________________________________________

______________________________________________________________________ (2)

v. Give **ONE** advantage of using oil instead of water as a liquid here to transmit pressure.

______________________________________________________________________ (1)

vi. If some air manages to find its way inside the oil in this system, what effect would this have on the braking force as calculated in part (iv)? Explain.

______________________________________________________________________

______________________________________________________________________ (2)

**(Total: 20 marks)**



20

3. This question is about nuclear physics.

   a. The Geiger–Müller tube below is switched on. It detects a small count of approximately 25 counts per minute.


      i. What is this radiation called?

_______________________________________________________________________________(1)

      ii. Name **TWO** possible sources causing this radiation.

_______________________________________________________________________________

_______________________________________________________________________________(2)

   b. Cobalt $^{60}_{27}Co$ is placed in front of the G.M. tube. The count-rate is observed to rise.

      i. Write down the number of protons, neutrons and electrons for a neutral cobalt atom.

      Protons: ____________________________________________________________(1)

      Neutrons: ___________________________________________________________ (1)

      Electrons: ___________________________________________________________ (1)

      ii. Cobalt-60 undergoes β (beta) decay. What does a beta-particle consist of and what is its charge?

_______________________________________________________________________________

_______________________________________________________________________________(2)

      iii. After the beta decay Nickel-60 is formed. Nickel-60 is still unstable and emits γ (gamma) radiation. Mention **TWO** differences between β and γ radiation.

- _________________________________________________________________________

  _________________________________________________________________________(1)

- _________________________________________________________________________

  _________________________________________________________________________(1)

iv. Describe an experiment you would do in order to show that beta particles, not alpha are present.

__________________________________________________________________________(4)

v. Mention **ONE** precaution taken when using radioactive sources.

__________________________________________________________________________(1)

c. Carbon-14 and Carbon-12 are two isotopes of carbon.

i. What is meant by the term isotope?

__________________________________________________________________________(2)

Carbon-14 is a radioactive substance with a half-life of 5600 years and every gram has a count-rate of 44 counts per minute.

ii. Explain the term half-life.

__________________________________________________________________________(1)

iii. What would be the count-rate for 1 g of carbon-14 in a piece of wood that is 11,200 years old?

__________________________________________________________________________(2)

**(Total: 20 marks)**

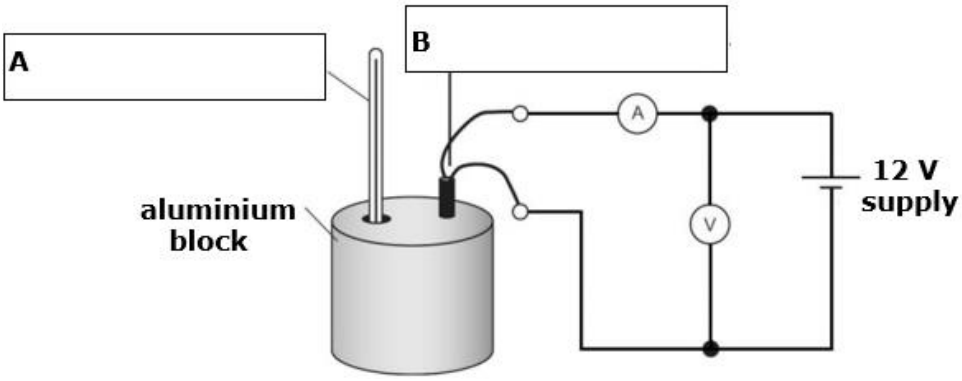
20

4. This question is about thermal physics.

a. All matter is made up of particles. The following table shows the similarities and differences in the particle properties between solids, liquids and gases. The ones for liquids have been filled in for you. Fill in the remaining properties for solids and gases. (6)

| | **solids** | **liquids** | **gases** |
|---|---|---|---|
| **spacing between particles** | | closely packed but not in order | |
| **forces between particles** | | strong | |
| **motion of particles** | | vibrate but also move randomly throughout the liquid | |

b. A group of students are carrying out an experiment to determine the specific heat capacity of an aluminium block, using an electrical heater. They set up the apparatus as shown.




i. Label on the diagram the **TWO** pieces of apparatus A and B. (2)

ii. They will need a stopwatch and one other measuring instrument to carry out the experiment. Name this instrument. ______________________ (1)

iii. How is the energy supplied to the block calculated from the stopwatch reading and apparatus A?

______________________________________________ (1)

iv. The teacher advised the students to put lagging around the block. Name a material which can be used for this purpose. ______________________ (1)

v. What is the function of the lagging around the block?

______________________________________________ (1)

vi. Underline the correct answer:

Without lagging, the calculated value of specific heat capacity would be **smaller than** / **equal to** / **greater than** the actual value. (1)

vii. Name **ONE** other precaution, not already mentioned, which is necessary to obtain an accurate result and explain how it achieves its purpose.

______________________________________________

______________________________________________

______________________________________________ (2)

c. Luca and Sarah are out camping with their families close to the seaside.

i. Sarah goes swimming and notices that when she comes out of the water, she feels a bit cold until the water still on her body dries up. Explain why cooling occurs as a liquid evaporates.

______________________________________________

______________________________________________ (2)

ii. Luca had two buckets. One of them was much wider than the other but they both had the same volume of water in them. He observed on the following day that more water evaporated from the wide bucket than from the narrower one. Explain why this occurred.

______________________________________________

______________________________________________ (1)

iii. Sarah had learned at school the fact that if the same amount of heat energy is given by the sun to 1 kg of sand and 1 kg of water, the sand heats up much more than the water. What can she say from this about the values of the specific heat capacity of each?

______________________________________________

______________________________________________ (1)

iv. Why is it that after sunset the sea takes a longer time to cool down than the sand?

______________________________________________

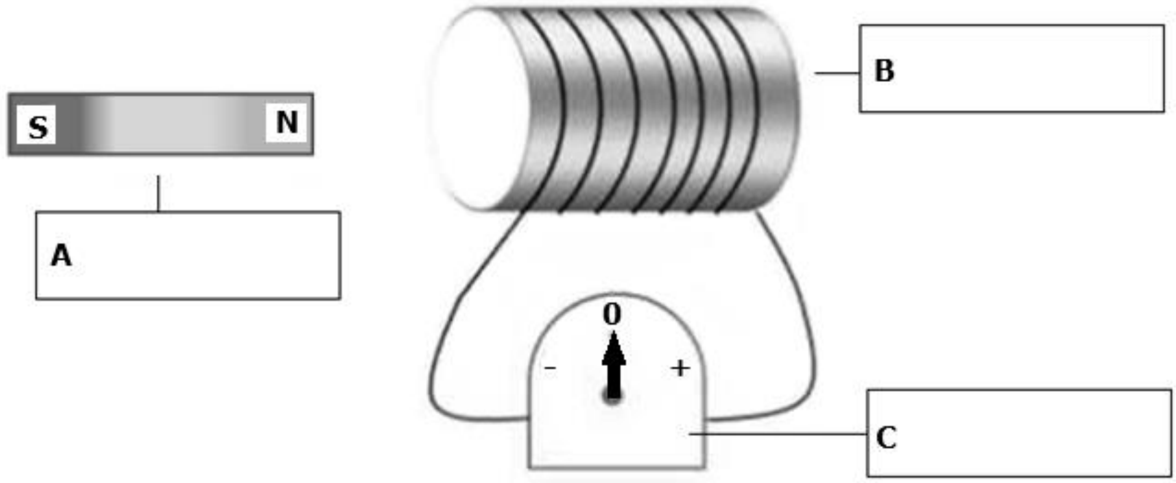
______________________________________________ (1)

**(Total: 20 marks)**

| |
|---|
| |
| 20 |

5. This question is about electromagnetism.

a. Melvin sets up the following apparatus in the laboratory to investigate the generation of electricity.




i. Label the apparatus indicated as A, B and C. (3)

ii. He moves apparatus A towards apparatus B and observes that the pointer deflects to the right. Explain.

______________________________________________________________________

______________________________________________________________________ (2)

iii. What happens if he moves apparatus A in the opposite direction? Explain.

______________________________________________________________________

______________________________________________________________________(2)

iv. Suggest **TWO** ways how a larger deflection can be obtained.

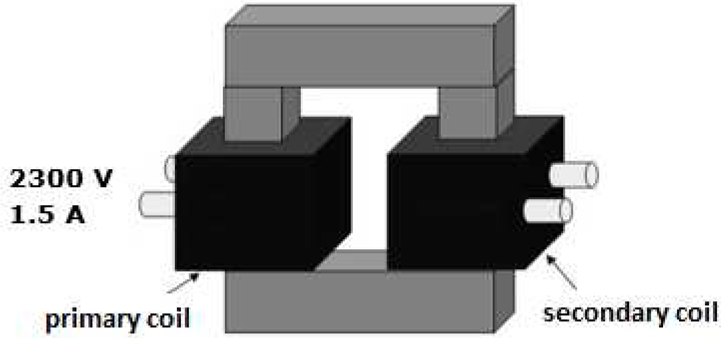
______________________________________________________________________(1)

______________________________________________________________________(1)

v. Suggest a suitable application for the above set up.

______________________________________________________________________(1)

b. He then sets up the following transformer with 2400 turns in the primary coil and 240 turns in the secondary coil. The primary coil is connected to a 2300 V, 1.5 A, A.C supply.




i. Is the transformer shown above, a step-up or a step-down transformer?

_____ (1)

ii. What is the use of such a transformer in everyday situations?

_____ (1)

iii. Why is the core made of iron and not steel?

_____

_____ (2)

iv. Determine the output voltage of this transformer.

_____

_____ (2)

v. Calculate the output current of this transformer.

_____

_____ (2)

vi. In reality, values differ slightly from the ones obtained. Why are the values different?

_____ (1)

vii. State Faraday's law of electromagnetic induction.

_____ (1)

**(Total: 20 marks)**

20

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