සියලු ම හිමිකම් ඇවිරිණි/முழுப் பதிப்புரிமையுடையது/All Rights Reserved

නව නිර්දේශය/புதிய பாடத்திட்டம்/New Syllabus

NEW ශ්‍රී ලංකා විභාග දෙපාර්තමේන්තුව இலங்கைப் பரீட்சைத் திணைக்களம் Department of Examinations, Sri Lanka

අධ්‍යයන පොදු සහතික පත්‍ර (උසස් පෙළ) විභාගය, 2020
கல்விப் பொதுத் தராதரப் பத்திர (உயர் தர)ப் பரீட்சை, 2020
General Certificate of Education (Adv. Level) Examination, 2020

තාක්ෂණවේදය සඳහා විද්‍යාව I தொழினுட்பவியலுக்கான விஞ்ஞானம் I **Science for Technology I**	**67 E I**	පැය දෙකයි இரண்டு மணித்தியாலம் ***Two hours***

Instructions:

* *Answer **all** the questions.*
* *Write your **Index Number** in the space provided in the answer sheet.*
* *Read the instructions given on the back of the answer sheet carefully.*
* *In each of the questions **1** to **50**, pick one of the alternatives from (1), (2), (3), (4), (5) which is **correct** or **most appropriate** and **mark your response on the answer sheet with a cross** (×) **in accordance with the instructions given on the back of the answer sheet.***
* ***Use of non-programmable calculators is allowed.***

1. The type of sugar present in RNA is
(1) glucose. (2) fructose. (3) ribose. (4) lactose. (5) sucrose.

2. All bacteria are
(1) anaerobic. (2) autotropic.
(3) pathogenic. (4) unicellular.
(5) industrially beneficial.

3. Consider the following statements about viruses.
A - Do not have a cell structure.
B - Contain both DNA and RNA.
C - All are obligate parasites.
Of the above, the correct statement/s is/are
(1) A only. (2) B only. (3) C only.
(4) A and B only. (5) A and C only.

4. Consider the following enzymatic reaction.

$$\text{Lactose} \xrightarrow{\text{hydrolysis}} X + Y$$

Of the above reaction, X and Y represent
(1) Glucose and Sucrose. (2) Fructose and Galactose.
(3) Glucose and Galactose. (4) Glucose and Fructose.
(5) Galactose and Moltose.

5. Rough endoplasmic reticulum transports,
(1) lipids. (2) proteins. (3) fatty acids. (4) minerals. (5) carbohydrates.

6. What is the correct statement given below regarding amino acids?
(1) A peptide bond is present.
(2) Carboxylic acids (COOH) and amine (NH_2) groups are present.
(3) Amine (NH_2) group is attached to the carboxylic acid (COOH) group.
(4) α-carbon is the carbon atom which belongs to the carboxylic acid (COOH) group.
(5) Only some amino acids contain a carboxylic acid (COOH) group.

7. What is the reason for mixing citric acid with soap, in the production of soap?
(1) To neutralize (2) To make acidic (3) To add a colour
(4) To make the soap dry (5) To remove unreacted fatty acids

[See page two

8. Consider the following issues faced by a manufacturer in the process of production.

A - High cost for the transportation of raw materials
B - Maintaining the quality of the final product
C - Losing raw materials during the pre-processing

Of the above, what issue/s could be mitigated by maintaining the quality of raw materials?

(1) A only. (2) B only. (3) C only.
(4) A and B only. (5) B and C only.

9. The amount of heat provided to a system from the surroundings was 100 J. The system retained 40 J and the rest was released to the surroundings. The total energy change in the universe is,

(1) −40 J. (2) 0 J. (3) 40 J. (4) 60 J. (5) 100 J.

10. A chemical reaction occurs in a production process which involves a solid and a liquid as raw materials. Due to the exothermic nature of the reaction, rate of reaction increases throughout the process. What is the best possible way to maintain the reaction at a constant rate?

(1) Heating the reaction mixture
(2) Stirring the reaction mixture
(3) Introducing the solid at once to the liquid
(4) Introducing the liquid slowly to the solid
(5) Crush the solid and mixing with the liquid

11. Secondary water treatment is mainly used to

(1) remove dissolved gasses.
(2) destroy microorganisms.
(3) remove insoluble particles.
(4) remove dissolved metal ions.
(5) remove organic substances.

12. A student states that the usage of HCFC (hydrochlorofluorocarbon) instead of CFC (chlorofluorocarbon) reduces damage to the ozone layer due to the following reasons.

A - Dissociation of C-H bond in HCFC before reaching the upper atmosphere.
B - Absence of Cl in HCFC.
C - The amount of HCFC used is less than that of CFC.

Of the above, the correct reason/s would be

(1) A only. (2) B only. (3) C only.
(4) A and B only. (5) B and C only.

13. Cleaner production approach used in industries

(1) minimizes the usage of raw materials.
(2) increases the use of natural resources.
(3) increases the release of waste to the environment.
(4) disconnect industries to make them independent.
(5) redesign the production processes to use clean raw materials.

14. Which of the following statements regarding the water quality parameters is correct?

(1) BOD represents the total microbial count.
(2) Turbidity indicates the total amount of suspended solids.
(3) COD expresses the amount of dissolved oxygen.
(4) Conductivity represents the amount of dissolved solid compounds.
(5) BOD expresses the amount of total dissolved organic matter.

15. What is expressed by the acid value regarding plant oil?

(1) pH value
(2) Acidity
(3) Percentage of fatty acids
(4) Amount of free acids
(5) Percentage of triglycerides

[See page three

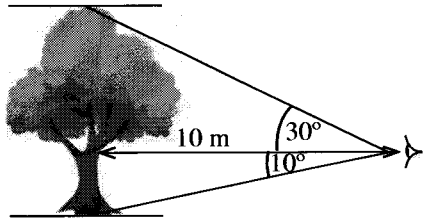
16. Which of the following statements is correct, regarding the extraction methods of secondary metabolites?
(1) Refluxing method requires a large volume of the solvent.
(2) Steam distillation produces an extract free of water.
(3) Refluxing method is suitable to extract thermally unstable compounds.
(4) For steam distillation, plant materials have to be mixed with water.
(5) Substances extracted into wax can be separated using ethanol.

17. Consider the following statements regarding essential oils.
A - Insoluble in water.
B - Volatile organic compounds.
C - Have a characteristic colour.
Of the above, the correct statement/s would be
(1) A only. (2) B only. (3) A and B only.
(4) A and C only. (5) B and C only.

18. Which of the following industries produce glycerol as a byproduct?
(1) Soap and biodiesel (2) Enamel and emulsion paints
(3) Soap and essential oil (4) Biodiesel and essential oil
(5) Vinegar and phosphate fertilizer

19. $\frac{7\pi}{6}$ radians in degrees is
(1) 190. (2) 200. (3) 210. (4) 220. (5) 230.

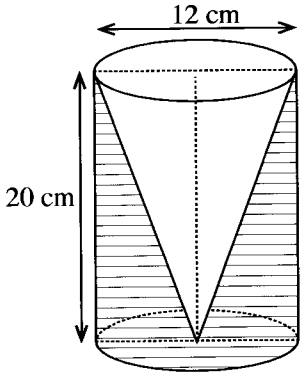
20. The diagram below shows the angle of depression of the base of the tree and angle of elevation of the top of the tree taken by a wildlife officer from eye level in order to calculate the height of a tree. What is the approximate height of the tree?



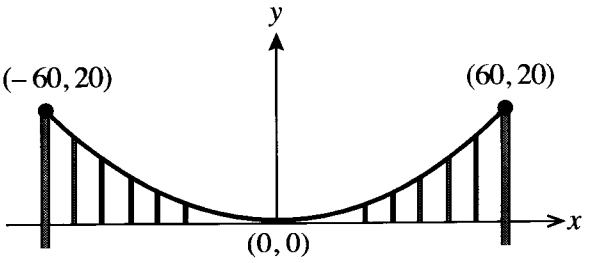
(1) 5.0 m.
(2) 5.8 m.
(3) 6.7 m.
(4) 7.5 m.
(5) 18.5 m.

	$\theta = 10°$	$\theta = 30°$
$\sin\theta$	≈ 0.1737	$= 0.5000$
$\cos\theta$	≈ 0.9848	≈ 0.8660
$\tan\theta$	≈ 0.1763	≈ 0.5773

21. To make a hollow wooden toy, a conical cavity of height 20 cm and diameter 12 cm is carved out from a wooden cylinder of the same height and diameter as shown in the figure. What is the **volume** of wood in the toy, in terms of π?
(1) 240π cm^3
(2) 480π cm^3
(3) 720π cm^3
(4) 960π cm^3
(5) 1920π cm^3



22. The diagram shows a suspension bridge with a parabolic cable hanging between two towers. Coordinates of the two end points of the cable are given. Which of the following equation models the parabolic shape of the cable?
(1) $y = 180x^2$
(2) $180y = x^2$
(3) $180y = -x^2$
(4) $y = x^2 + 60x + 20$
(5) $y = x^2 - 60x + 20$



[See page four

● Questions **23** and **24** are based on the information given below.

A conical shaped strainer of base radius 6 cm (**Figure 2**) is made by connecting the edges *AO* and *BO* of a sector shaped metal sheet of radius 10 cm (**Figure 1**), without an overlap.

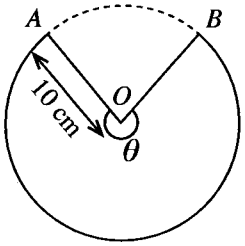


Figure 1

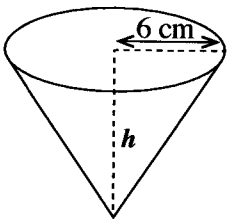


Figure 2

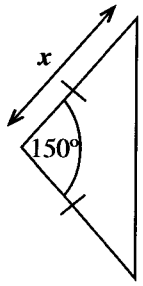
23. What is the perpendicular height h of the strainer?

(1) 4.0 cm (2) 8.0 cm (3) 10.0 cm (4) 11.6 cm (5) 12.0 cm

24. What approximate angle θ subtended at the centre (**Figure 1**), in radians, must be used in the sector in order to make this strainer? (Consider $\pi = 3$.)

(1) 0.64 (2) 0.85 (3) 1.29 (4) 2.51 (5) 3.60

25. The area of the isosceles triangular shaped vegetable plot shown in the figure is 16 m^2. The equal side lengths are x each. What is the value of x in meters? ($\sin 150° = \frac{1}{2}$)



(1) $\sqrt{8}$ (2) $\sqrt{16}$ (3) $\sqrt{32}$

(4) 8 (5) 32

26. What is the total surface area, in terms of π, of a solid hemisphere of base radius 15 cm?

(1) 300π cm^2 (2) 450π cm^2 (3) 525π cm^2 (4) 675π cm^2 (5) 1125π cm^2

27. The annual profits/losses (in thousands of rupees) for the first seven years of a company are given below. The negative values indicate the losses.

–472, –600, –672, 125, 488, 525, 962

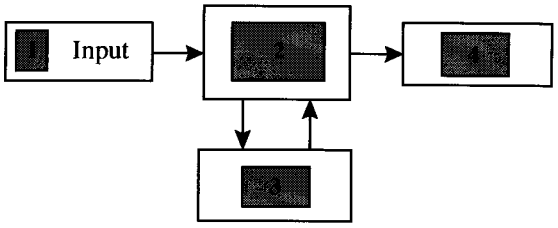
What is the range of the above data?

(1) 290 (2) 490 (3) 837 (4) 1434 (5) 1634

28. The mean score of 20 students for Science for Technology self-marking online examination is 67. However, the class teacher later found that two students' scores of 89 and 72 were incorrectly recorded as 98 and 27 respectively. What is the correct mean value of the students' scores?

(1) 65.2 (2) 66.1 (3) 67.0 (4) 67.9 (5) 68.8

29. The following diagram shows the relationship among the basic functions of a computer.

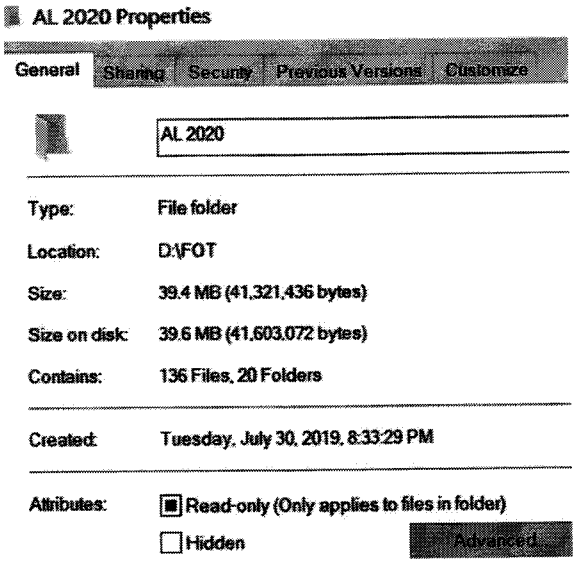


Box 1 represents 'Input'. Functions represented by boxes 2, 3 and 4 respectively are,

(1) Storage, Processing and Controlling, Output.
(2) Processing and Controlling, Storage, Output.
(3) Storage, Output, Processing and Controlling.
(4) Processing and Controlling, Output, Storage.
(5) Output, Processing and Controlling, Storage.

[See page five

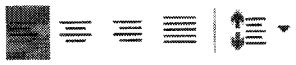
30. The diagram below provides information about a folder in a computer.



What is the **incorrect** statement regarding the folder?

(1) The folder contains 20 sub folders.
(2) The date of creating the folder is 30.07.2019.
(3) Name of the folder is 'AL 2020 Properties'.
(4) The number of files in the folder is 136.
(5) The folder is located in the D partition.

31. What is the name of the toolbar given in the figure?



(1) Font
(2) Styles
(3) Paragraph
(4) Editing
(5) Clipboard

32. The bold words in the initial version were changed as shown in the edited version.

Initial version (Before editing)

The **new or** novel corona virus was reported in **Wuhan, China** in December 2019.

Edited version

The ~~**new or**~~ novel corona virus was reported in **WUHAN, CHINA** in December 2019.

What commands in the 'Font' toolbar were used to make the changes in the edited version?

(1) Underline, All Caps
(2) Underline, Small Caps
(3) Strikethrough, Small Caps
(4) Strikethrough, All Caps
(5) Double strikethrough, All Caps

33. How can a 'column width' of a spreadsheet be fit to its 'content width'?

(1) Single-click on the left boundary of the column heading
(2) Double-click on the left boundary of the column heading
(3) Single-click on the right boundary of the column heading
(4) Double-click on the right boundary of the column heading
(5) Press Alt and single-click anywhere in the column

[See page six

34. Which set of three cell references given below correctly shows 'absolute column reference' and 'relative row reference'?
(1) A$1, A$10:$A17, $X255
(2) $A1, $A10:$A17, X$255
(3) $A1, $A10:$A17, $X255
(4) A$1, $A$10:$A17, $X255
(5) $A$1, $A$10:$A17, X$255

35. What are the correct steps to add a new slide to an existing presentation?
(1) File, Open
(2) File, New
(3) Insert, Object
(4) Insert, New slide
(5) File, Add a new slide

36. In internet terminology IP stands for
(1) Internet Provider.
(2) Internet Password.
(3) Internet Protocol.
(4) Internet Processor.
(5) Internet Programs.

37. What is the **incorrect** recommendation regarding the safe use of e-mails?
(1) Change your password frequently.
(2) Do not reply to spam emails.
(3) Always keep the antivirus software up-to-date.
(4) Logout from the email account after completing the work.
(5) Always enable the auto-saving password mode.

38. What activity is **not** supporting social distancing?
(1) Internet hacking
(2) Online banking
(3) e-commerce
(4) Video conferencing
(5) e-channelling

39. Joule (J) is,
(1) N m. (2) $N\,m^{-1}$. (3) $N^{-1}\,m^{-1}$. (4) $N\,m^{-2}$. (5) $N^{-1}\,m$.

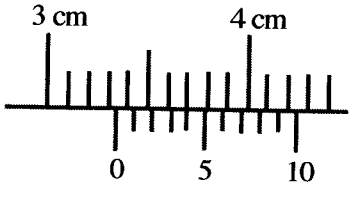
40. The amount of electric charge flowing through a wire per unit time is defined as,
(1) current. (2) power. (3) resistance. (4) resistivity. (5) voltage.

41. A man of mass 80 kg takes 10 s to climb up a staircase of vertical height 10 m at a constant speed. What is the rate of work done by him? ($g = 10\ N\ kg^{-1}$)
(1) 0.8 kW (2) 8 kW (3) 80 kW (4) 800 kW (5) 8000 kW

42. An electric kettle spends 9 minutes and 20 seconds to raise the temperature of 2 kg of water from 10 °C to 90 °C. What is the power of the kettle?
(Specific heat capacity of water = 4200 $J\ kg^{-1}\ °C^{-1}$)
(1) 1.0 kW (2) 1.2 kW (3) 672 kW (4) 840 kW (5) 1500 kW

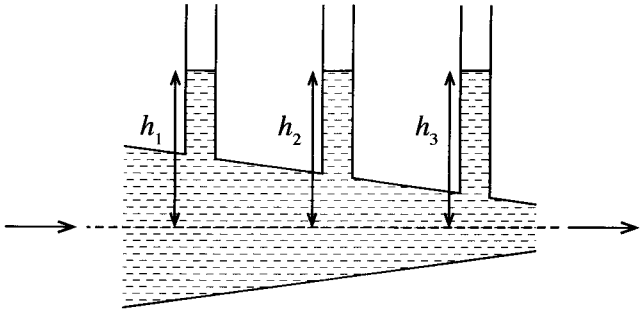
43. A spring with a spring constant 40 $N\ cm^{-1}$ shows an extension of 2.3 cm when an object is hung from it. What is the mass of the object? (Neglect the mass of the spring.)
(1) 9.0 kg (2) 9.1 kg (3) 9.2 kg (4) 9.3 kg (5) 9.4 kg

44. What is the measurement indicated by the given reading face of a Vernier caliper with the least count of 0.01 cm?
(1) 0.34 cm
(2) 3.04 cm
(3) 3.30 cm
(4) 3.34 cm
(5) 3.40 cm



[See page seven

45. When water is at rest, heights of the water columns, h_1, h_2 and h_3 are the same as given in the setup. What is the correct relationship among the heights of the water columns, when water flows steadily and nonturbulently (streamline flow) to the right at a constant rate?

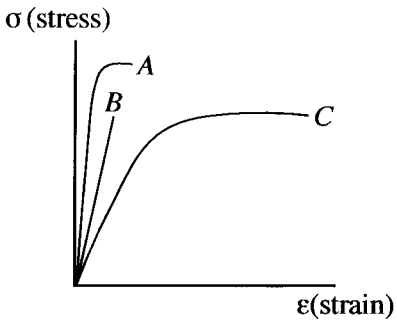


(1) $h_1 = h_2 = h_3$ (2) $h_1 = h_3 > h_2$

(3) $h_1 = h_3 < h_2$ (4) $h_1 < h_2 < h_3$

(5) $h_1 > h_2 > h_3$

46. Figure shows stress versus strain curves for three materials *A*, *B* and *C*. Material with the highest **ductility**, material with the highest **brittleness** and the **strongest** material are respectively represented by graphs



(1) *C*, *A* and *B*.

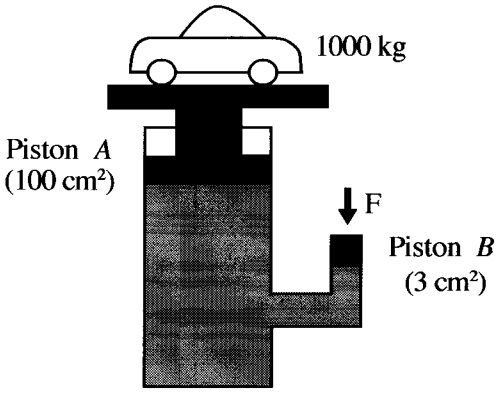
(2) *C*, *B* and *A*.

(3) *B*, *A* and *C*.

(4) *B*, *C* and *A*.

(5) *A*, *B* and *C*.

47. A car of 1000 kg is lifted by a hydraulic pressure system as shown in the figure. If the area of piston *A* is 100 cm^2 and piston *B* is 3 cm^2, what is the minimum force F, that should be applied on the piston *B* to lift and hold the car? (g = 10 N kg^{-1})



(1) 3 N

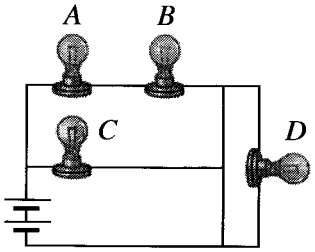
(2) 25 N

(3) 30 N

(4) 100 N

(5) 300 N

48. Four identical filament bulbs are connected to a battery as shown in the diagram below. What is the correct statement regarding the brightness of the bulbs?



(1) Bulbs *A*, *B* and *D* glow with the same brightness.

(2) Brightness of bulbs glow is in the descending order of $C > A > B > D$.

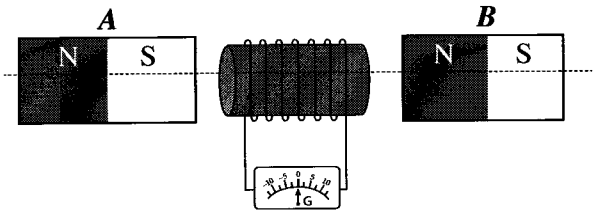
(3) Bulbs *A*, *B* and *C* glow with the same brightness while *D* does not light up.

(4) Bulbs *A* and *B* glow with the same brightness while *D* does not light up.

(5) Bulb *C* glows with the highest brightness and *D* glows with the lowest brightness.

[See page eight

49. A conducting coil is attached to a centre zero galvanometer. Two identical bar magnets, ***A*** and ***B***, are placed besides the coil from equidistance as shown in the figure. What movements of the pair of magnets along the dotted line at a constant speed create a minimum deflection on the galvanometer?



Right side movement is denoted by ⟶ and the left side movement is denoted by ⟵.

	A	***B***
(1)	At rest	⟵
(2)	⟶	At rest
(3)	⟶	⟵
(4)	⟵	⟶
(5)	⟶	⟶

50. Consider the following statements regarding the vacuum region in a thermo flask.

A - It minimizes the heat loss through conduction.
B - It minimizes the heat loss through convection.
C - It minimizes the heat loss through radiation.

Of the above, the correct statement/s would be

(1) A only. (2) B only. (3) A and B only.
(4) A and C only. (5) all A, B and C.

* * *

AL/2020/67/E-II(NEW)

සියලු ම හිමිකම් ඇවිරිණි/முழுப் பதிப்புரிமையுடையது/All Rights Reserved]

නව නිර්දේශය/புதிய பாடத்திட்டம்/New Syllabus

NEW ශ්‍රී ලංකා විභාග දෙපාර්තමේන්තුව ශ්‍රී ලංකා විභාග දෙපාර්තමේන්තුව
இலங்கைப் பரீட்சைத் திணைக்களம்
Department of Examinations, Sri Lanka

අධ්‍යයන පොදු සහතික පත්‍ර (උසස් පෙළ) විභාගය, 2020
கல்விப் பொதுத் தராதரப் பத்திர (உயர் தர)ப் பரீட்சை, 2020
General Certificate of Education (Adv. Level) Examination, 2020

තාක්ෂණවේදය සඳහා විද්‍යාව தொழினுட்பவியலுக்கான விஞ்ஞானம் **Science for Technology**	II II II	**67 E II**

පැය තුනයි
மூன்று மணித்தியாலம்
Three hours

අමතර කියවීම් කාලය - මිනිත්තු 10 යි
மேலதிக வாசிப்பு நேரம் - 10 நிமிடங்கள்
Additional Reading Time - 10 minutes

Use additional reading time to go through the question paper, select the questions you will answer and decide which of them you will prioritise.

Index No. : .....

Instructions :

* *This question paper consists of* **13** *pages.*
* *This question paper comprises of* ***four Parts*** **A, B, C** *and* **D**. *The time allotted for* ***all parts*** *is* ***three hours***.
* ***Use of non-programmable calculators is allowed***.

Part A - Structured Essay
(Pages 2 - 7)

* *Answer* ***all*** *the questions* ***on this paper itself***.
* *Write your answers in the space provided for each question. Note that the space provided is sufficient for your answers and that extensive answers are not expected.*

Parts B, C and D - Essay
(Pages 8 - 13)

* *Select minimum of* ***one*** *question from each of the* ***parts B***, ***C*** *and* ***D*** *and answer* ***four*** *questions only. Use the papers supplied for this purpose. At the end of the time allotted for this paper, tie* ***all parts*** *together so that* ***Part A*** *is on the top of* ***Parts B***, ***C*** *and* ***D*** *before handing over to the supervisor.*
* *You are permitted to remove only* ***Parts B, C*** *and* ***D*** *of the question paper from the examination hall.*

For Examiners' Use Only

Part	Question Nos.	Marks Awarded
A	1	
	2	
	3	
	4	
B	5	
	6	
C	7	
	8	
D	9	
	10	
Total	In Numbers	
	In Words	

Code Numbers

Marking Examiner 1	
Marking Examiner 2	
Checked by	
Supervised by	

[see page two

Do not write in this column

Part A – Structured Essay

*Answer **all questions on this paper itself**.*

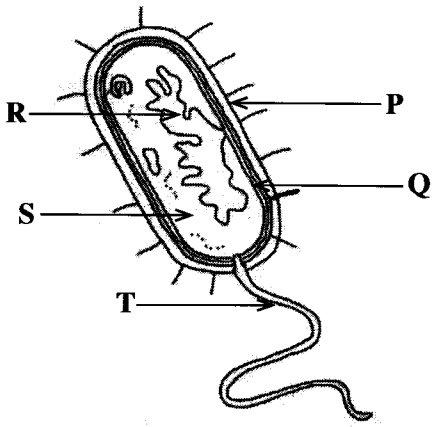
1. (A) The cell is the basic unit of all living organisms. Based on the structure and organization, cells can be divided into two main groups.

(i) Name these **two** main groups of cells.

.....

.....

(ii) What is the group of microorganisms shown in the following diagram? Name the parts labelled as **P**, **Q**, **R**, **S** and **T**.



(a) The group of microorganisms .....

(b) **P** : .....

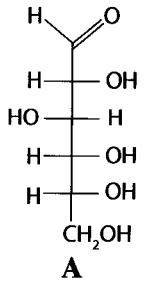
Q : .....

R : .....

S : .....

T : .....

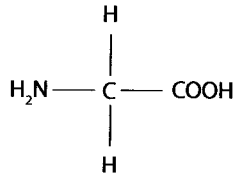
(B) Four types of biomolecules that are used in different industries are given below. Answer the following questions based on the given biomolecules.



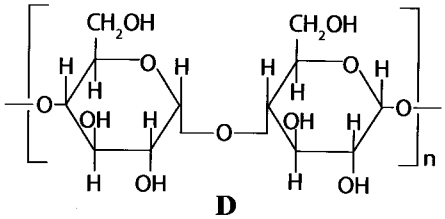
A

$CH_3(CH_2)_{14}COOH$

C



B



D

(i) What biomolecule/s contains/contain an aldehyde group as a functional group?

.....

(ii) What biomolecule/s contains/contain a carboxylic acid group as a functional group?

.....

(iii) Which biomolecule/s provides/provide a positive result for the iodine test?

.....

[see page three

Do not write in this column

0271

(iv) Name a suitable test to identify biomolecule **B**.

.....

(v) Identify what biomolecule or its derivative given above contains in each industrial product mentioned in the table. Write the letter that represents each identified biomolecule in the following table.

Industrial product	Letter that represents the biomolecule
cotton thread	
soap	
sugar	

(C) Bread is one of the most commonly produced products in the bakery industry. If the required ingredients are available, bread can also be produced at home.

(i) What is the microorganism used in the bakery industry?

.....

(ii) What is the raw material added to accelerate the growth of the microorganism in the process of bread production?

.....

(iii) Explain why the dough rises along with the activity of microorganism.

.....

.....

.....

(iv) The bread develops a sour taste when the dough is kept for a long time for rising prior to baking. Explain the reason for this.

.....

.....

.....

Q.1

100

[see page four

Do not write in this column

2. (A) An experiment was conducted to determine the drying speed of an emulsion paint. Here a paint sample of 5.05 g was spread evenly on a plate and the mass of the paint sample was measured at 60 minute intervals. The results are given in the table, and the reason for the mass loss with the time is vaporization of water in the paint.

Time/min	Mass/g (30 °C)
0	5.05
60	4.71
120	4.50
180	4.35
240	4.24
300	4.18
360	4.15
420	4.15

(i) What is meant by vaporization?

.....

(ii) After 360 minutes, a constant mass of the paint sample was observed in the experiment. Calculate the mass of water evaporated from the paint sample.

.....

(iii) Give the mass of water in the paint sample as a percentage.

.....

(iv) Write **one** benefit of using water to produce emulsion paint.

.....

(B) The physical transformation of water during the drying process of paint can be shown as below.

Water (liquid) ⟶ Water vapour (gas)

Four statements regarding the above physical transformation are given in the table below. Put a tick (✓) in front of the correct statements and a cross (×) in front of the incorrect statements.

	Statements	✓ or ×
(i)	The physical transformation of liquid water to water vapour is exothermic.	
(ii)	Energy of water molecules in the vapour phase is higher than that of the water molecules in the liquid phase.	
(iii)	Water molecules in the liquid phase are closely packed compared to the water molecules in the vapour phase.	
(iv)	Average speed of water molecules in the vapour phase is greater than that of the water molecules in the liquid phase.	

(C) (i) Write **two** factors that affect the vaporization rate of water in the paint sample.

.....

.....

[see page five

Do not write in this column

(ii) Calculate the average rate of vaporization of water in the first six hours.

.....

.....

.....

.....

(iii) Polymers are a group of raw materials used for the production of paint. Write **two** other groups of raw materials used in the paint industry.

.....

.....

(iv) It is not suitable to apply a paint containing polyester as the polymeric material on a cement surface. Explain the reason for this?

.....

.....

Q.2

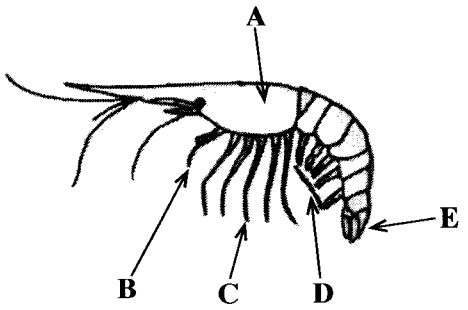
100

3. (A) Prawn is an invertebrate animal that belongs to the phylum Arthropoda. Prawn farming is a profitable business in Sri Lanka.

(i) Write **one** structural feature that is used to classify prawn as an invertebrate.

.....

(ii) Name the parts labelled as **A**, **B**, **C**, **D** and **E** in the given diagram of a prawn.



Part	Name
A	
B	
C	
D	
E	

(iii) Write **one** reason for classifying the prawn under the phylum Arthropoda.

.....

(iv) Mention an economically important raw material that can be extracted from the prawn's exoskeleton.

.....

(v) Write **one** geographical feature that must be considered in establishing a prawn farm.

.....

(vi) Write **one** method of value addition that can be done in the processing of prawns for the international market.

.....

[see page six

Do not write in this column

(B) Water is pumped at the rate of 5.4 $m^3 h^{-1}$ from a well to a tank.

(i) What is the rate of water pumping in the unit $m^3 s^{-1}$?

.....

.....

(ii) Calculate the mass of water pumped per second. (Density of water = 1000 kg m^{-3})

.....

.....

.....

(iii) Calculate the work done per second (power) by the pump in lifting water to a height of 6 m from the well to fill the tank. (Gravitational acceleration = 10 N kg^{-1})

.....

.....

.....

(iv) Can you practically use a pump driven by a motor having exactly the same power calculated in part (iii) to pump water to the tank? Briefly explain your answer.

.....

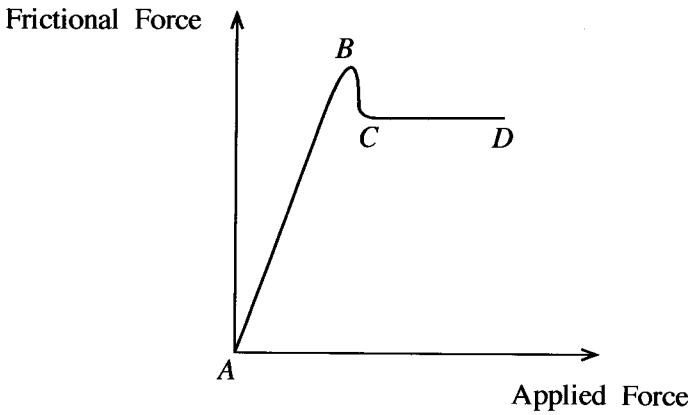
.....

.....

Q.3

100

4. (A) The following graph shows the variation of the frictional force with the force applied on an object.



(i) What segment of the graph represents each of the following force?

(a) Dynamic frictional force .....

(b) Static frictional force .....

(ii) What is meant by limiting friction?

.....

.....

.....

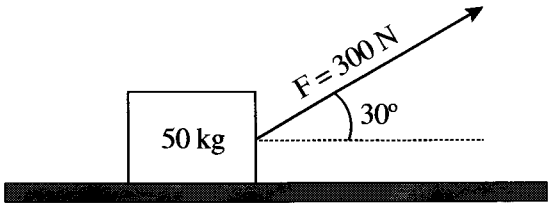
[see page seven

Do not write in this column

(iii) Which point represents the limiting friction on the graph?

.....

(B) A person pulls a box of mass 50 kg along a frictionless horizontal floor using a non-extendable light rope which is inclined at an upward angle of 30° with the horizontal as shown in the figure. The person exerts a constant force of magnitude 300 N on the rope. (Consider sin 30° = 0.50 and cos 30° = 0.87)



(i) Mark on the above figure, the normal reaction and the gravitational force acting on the box.

(ii) Calculate the acceleration of the box.

.....

.....

.....

(iii) Calculate the work done by the applied force when the box is moved by 2 m.

.....

.....

.....

(iv) Consider that the above box is pulled with a light metal wire. If the metal wire is extended by 2 mm due to the applied force 300 N, calculate the elastic potential energy stored in the wire.

.....

.....

.....

Q.4

100

* *

[see page eight

සියලු ම හිමිකම් ඇවිරිණි /முழுப் பதிப்புரிமையுடையது/All Rights Reserved]

නව නිර්දේශය/புதிய பாடத்திட்டம்/New Syllabus

NEW ශ්‍රී ලංකා විභාග දෙපාර්තමේන්තුව இலங்கைப் பரீட்சைத் திணைக்களம் Department of Examinations, Sri Lanka

අධ්‍යයන පොදු සහතික පත්‍ර (උසස් පෙළ) විභාගය, 2020
கல்விப் பொதுத் தராதரப் பத்திர (உயர் தர)ப் பரீட்சை, 2020
General Certificate of Education (Adv. Level) Examination, 2020

තාක්ෂණවේදය සඳහා විද්‍යාව II தொழினுட்பவியலுக்கான விஞ்ஞானம் II **Science for Technology II**	**Essay**	67	E	II

Instructions:

* *Select minimum of **one** question each from **parts B**, **C** and **D** and answer **four** questions only.*
* *Each question carries **150** marks.*
* *Graph sheet required for question number **5 in part B** is provided with the question paper.*
* ***Use of non-programmable calculators is allowed.***

Part B - Essay

5. **Table 1** shows the distribution of the incubation period (time period between the exposure to the virus and the appearance of the first symptom) of randomly selected 200 individuals who were infected by the Corona virus. The third column of the table indicates the **average** age of the infectants for each class interval.

Table 1: Grouped frequency distribution for the incubation period and the **average** age of 200 infectants

Incubation period (days)	Number of infectants	Average age (years)
2 - 3	6	88.5
4 - 5	90	72.5
6 - 7	78	78.0
8 - 9	12	68.5
10 - 11	4	54.5
12 - 13	4	50.0
14 - 15	4	24.5
16 - 17	2	20.0
Total	**200**	

(a) (i) Copy the **Table 2** given below to the answer booklet and complete the columns of class boundary, class mark, less than cumulative frequency and less than percentage cumulative frequency.

Table 2: Grouped frequency distribution for the incubation period of 200 infectants

Class limit	Number of infectants (frequency)	Class boundary	Class mark	Less than cumulative frequency	Less than percentage cumulative frequency
2 - 3	6				
4 - 5	90				
6 - 7	78				
8 - 9	12				
10 - 11	4				
12 - 13	4				
14 - 15	4				
16 - 17	2				

[see page nine

(ii) Calculate the **mean** incubation period of the infectants participated in the study.

(b) Draw the less than percentage cumulative frequency curve for the distribution given in **Table 2** on the graph paper provided with the question paper in page 14, and attach it to the answer script.

(c) Based on the less than percentage cumulative frequency curve drawn in part (b), find the following.

(i) Median of incubation period of the infectants

(ii) Lower boundary and upper boundary of the middle 90% data of the incubation period of the infectants

(d) Assume that the quarantine period for the infectants is decided based on their incubation periods. Based on the less than percentage cumulative frequency curve drawn in part (b), answer the following questions.

(i) Find the minimum quarantine period required to identify 99% of the infectants.

(ii) Suppose that there are 3000 Corona suspects in the quarantine centres and they are kept there up to a maximum period of 14 days. If these suspects are infected by the virus, then how many infectants are expected to show up symptoms during the quarantine period?

(e) Using **Table 1**, find the **average** age of the Corona infectants participated in the study.

6. This question is based on a basic concept of a technology used to make judgments in Cricket. **Figure 1** shows the top view of a cricket ground. A and B are positions of two fielders. The dotted line CD shows the straight path of the ball hit by the batsman. A Cartesian coordinate system is placed on the image, so that its origin coincides with the centre of the circular ground. (This diagram is not drawn to scale.)

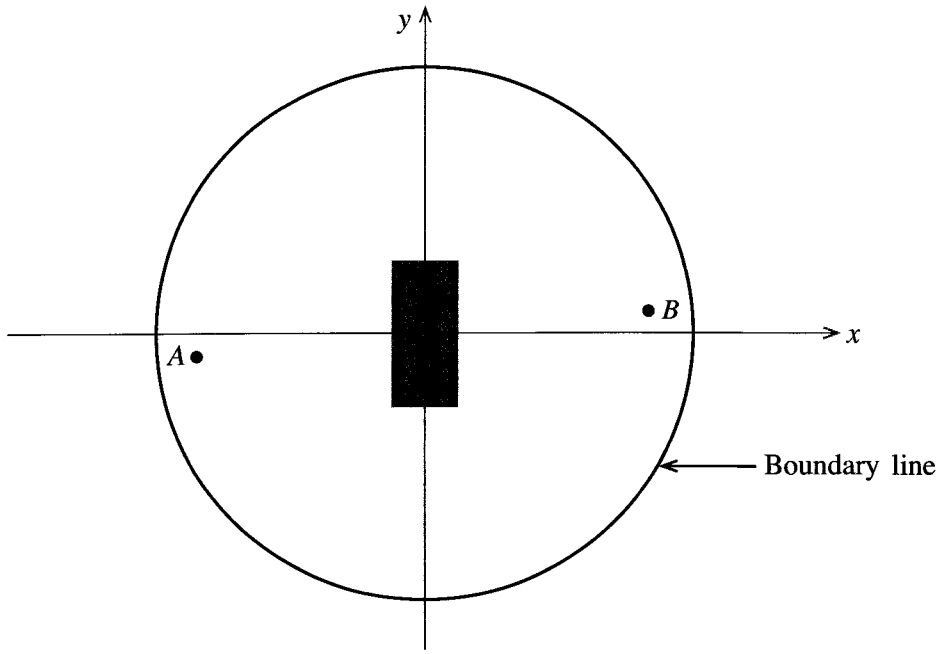


Figure 1

(a) The midpoint of straight line AB is the origin (0, 0). The coordinates of point B are (30, 0.2). Find the following.

(i) Coordinates of point A

(ii) Gradient of line AB

(b) The coordinates of point C are (0, 8). Line CD is perpendicular to the line AB. Find the following of the straight line CD.

(i) Gradient

(ii) y Intercept

(iii) Equation

[see page ten

(c) Along the *CD* line, the ball travels towards the opposite wicket. Given that the coordinates of a stump are (0.12, –10), determine whether the ball hits this stump.

(d) The sector *CMN* in **Figure 2** indicates the strongest batting region of a batsman batting at *C*. It is given that the angle $M\hat{C}N$ is 30° and the radius *CM* is 62 m. Calculate the following.

(i) Angle $M\hat{C}N$ in radians

(ii) The arc length *MN* (Consider $\pi = 3$)

(iii) The area of sector *CMN* (Consider $\pi = 3$)

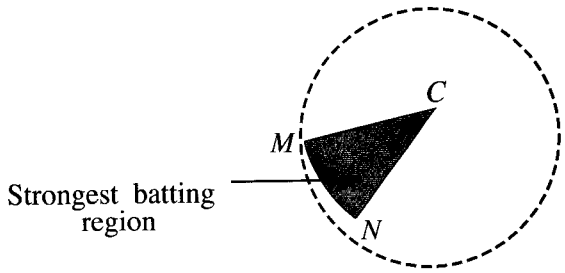


Figure 2

(e) The play area of the ground is confined by the circular boundary line. Given the coordinates of a point on the boundary line are (16, 63), calculate the following of the playing area. (Consider $\pi = 3$)

(i) The radius

(ii) The area

Part C - Essay

7. A group of students in the technology stream started a project to produce reusable face masks.

(a) (i) What is expected by using a face mask?

(ii) Why is it not recommended to use a face mask during sports activities?

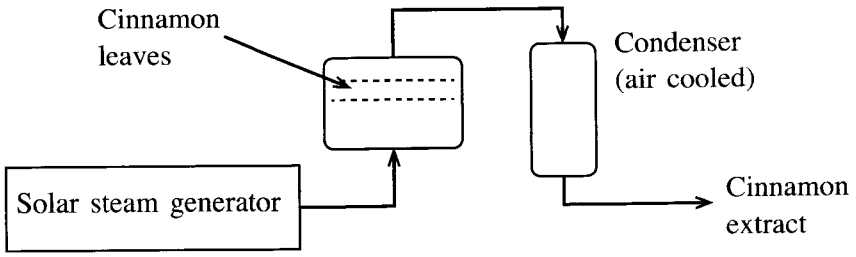
(iii) According to the 3R concept, write **two** objectives of producing a reusable face mask?

(b) School Technology Club is planning to produce the face mask in a large-scale to generate funds.

(i) What are the **five** main resources required to start a production process?

(ii) Write **two** factors that must be considered in selecting a natural raw material for a production process.

(c) It is planned to improve the quality of the face mask by treating (soaking) its outer layer with a diluted extract of cinnamon leaves containing many secondary metabolites. The process used to produce cinnamon extract is shown by the flow chart given below.



(i) What is the main secondary metabolite extracted from cinnamon?

(ii) Write **one** property that can be introduced to the face mask by treating its outer layer with the cinnamon extract.

(iii) State **two** renewable resources used to produce the cinnamon extract in the above process.

(iv) Write **one** environmental advantage and **one** economical advantage of using a solar steam generator for the above extraction process.

(v) State **two** issues arise in producing steam by using solar energy.

[see page eleven

(vi) The parabolic surface area which directs solar radiation to the steam generator is 3 m^2. The energy supply from this surface to the steam generator is 1 kJ m^{-2} s^{-1}. Calculate the amount of energy collected in an hour by the steam generator.

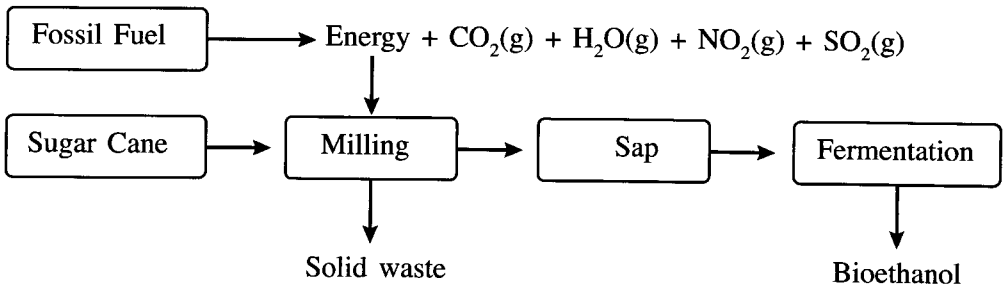
(vii) Calculate the time required to produce 1 g of steam after starting the production of steam by receiving energy at the above rate. (The latent heat of vaporization of water is 2.26 MJ kg^{-1})

8. (a) Sucrose is a disaccharide.

(i) Name the **two** monosaccharides contained in sucrose.

(ii) What is the main biological function of sucrose?

(b) Sucrose is a primary metabolite produced in sugar cane. The extracted sugar cane sap can be converted to ethanol by using microorganisms. The production process of bioethanol by using sugar cane is shown below.



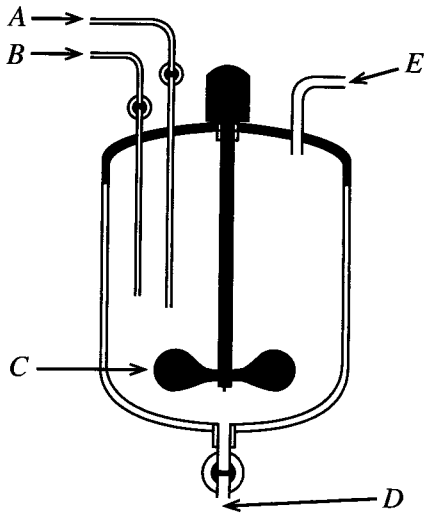
(i) What are the gasses produced in the above process that contribute to acid rain?

(ii) Name the greenhouse gasses produced in this process.

(iii) State **two** advantages and **two** disadvantages of using bioethanol as a fuel.

(iv) Write **two** main advantages of chemical synthesis of ethanol.

(c) Ethanol, hydrogen peroxide, glycerol and distilled water are the main ingredients of a hand sanitizer formula recommended by the World Health Organization (WHO). The reaction chamber used for the production of hand sanitizer is shown below.



(i) What is the function of each part labelled as *A*, *B*, *C*, *D* and *E* in the diagram?

(ii) It is recommended to perform the above production process at low temperatures. Explain the reason for that.

(iii) What is the main function of hydrogen peroxide in the sanitizer?

[see page twelve

Part D - Essay

9. (a) Consider an object executing uniform circular motion in a circular path of radius r. The equation $v = r\omega$ can be used to calculate its angular velocity.

(i) Name the physical quantities represented by v and ω.

(ii) An object executing a circular motion is always associated with an acceleration, even though the object moves with a constant speed. Explain the reason for that.

(b) Awaiting clearance for landing at an airport, an aircraft is circling in the sky with the speed of 100 m s^{-1}. If the radius of circular path of the aircraft is 4 km, calculate its,

(i) angular velocity, in rad s^{-1} and

(ii) periodic time, in minute.

(Consider $\pi = 3$)

(c) You are provided with sufficient number of identical resistors, each with the resistance of 80 Ω. Using **minimum number** of given resistors, draw separate circuit diagrams to obtain following equivalent resistance.

(i) 40 Ω

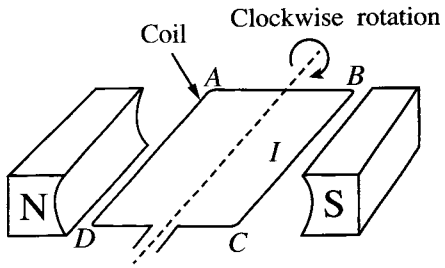
(ii) 400 Ω

(iii) 460 Ω

(d) (i) The figure shows a sketch of a dynamo. What is the direction of each of the following parameters?

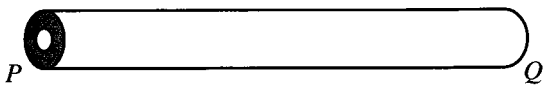
(1) The magnetic field between magnetic poles N and S.

(2) The current (I) between B and C?

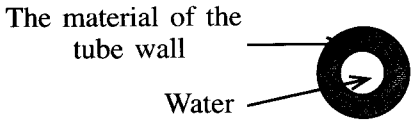


(ii) Write down the **three** major factors that affect the amount of current generation in the dynamo.

10. Hot water entering at one end of a straight tube PQ which is placed in air, leaves at the other end as cold water. Heat is transfered across the tube material of the tube wall.



Tube



Cross section of the tube

(a) Does the heat transfer in the above tube occur from water to air or air to water?

(b) Which method out of conduction, convection and radiation is the main mode of heat transfer between each of the following pairs?

(i) Hot water inside the tube and the material of the tube wall

(ii) Material of the tube wall and surrounding air

[see page thirteen

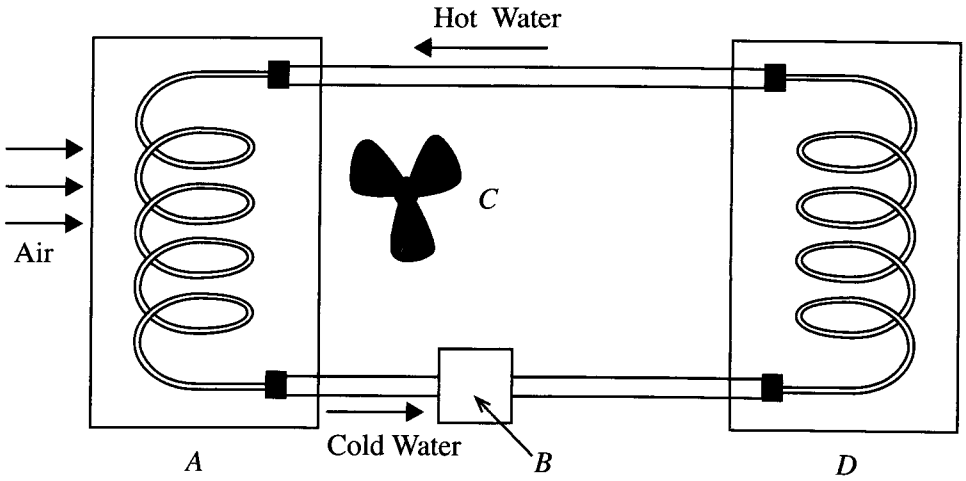
(c) The heat transfer between the hot water in the tube and the surrounding air of the tube has to be made more efficient. In order to do so, five factors are to be changed. With regard to the change in each factor, suggestions given by student A and student B are shown below.

	Factors to be changed	**Suggestion made by Student A**	**Suggestion made by Student B**
(1)	Material of the tube	Use rubber	Use copper
(2)	Outer surface of the tube	Keep non-insulated	Keep insulated
(3)	Nature of the outer surface of the tube	Make it rough	Make it polished
(4)	Nature of the tube	Keep it short and straight	Keep it lengthy and spiral
(5)	Surrounding air of the tube	Maintain as a fast air flow	Maintain as a slow air flow

(i) From the above suggestions given by students **A** and **B** for each factor from (1) to (5), write the more suitable suggestions?

(ii) Give reasons for each of your decision given in (i) above.

(d) When a motor-car-engine runs, as it gets heated continuously, the engine has to be cooled using a cooling system. The block diagram of such a cooling system with basic components *A*, *B*, *C* and *D* is shown below. Engine and the cooling unit (radiator) are represented by two spiral tubes.



Name the component out of *A*, *B*, *C* and *D* which contributes to each of the functions given below.

(i) Heat generation

(ii) Cooling

(iii) Circulation of water

(iv) Circulation of air

(e) Hot water at temperature 90 °C flows into the radiator at the rate of 0.5 kg s^{-1}. If the temperature of the exit water is 40 °C, calculate the rate of heat loss.
(Specific heat capacity of water is 4200 J kg^{-1} $°C^{-1}$.)

* * *

AL/2020/67-II(NEW)

විභාග අංකය/ சுட்டெண் / Index No. : .....

තාක්ෂණවේදය සඳහා විද්‍යාව தொழினுட்பவியலுக்கான விஞ்ஞானம் Science for Technology	II II II	67 II	ප්‍රශ්න අංකය வினா இல. Question No.	5 (b)

0271