

STUDENT NUMBER Letter

VCE VET ENGINEERING STUDIES

Written examination

Tuesday 21 November 2017

Reading time: 9.00 am to 9.15 am (15 minutes)

Writing time: 9.15 am to 10.45 am (1 hour 30 minutes)

QUESTION AND ANSWER BOOK

Structure of book

<i>Section</i>	<i>Number of questions</i>	<i>Number of questions to be answered</i>	<i>Number of marks</i>
A	20	20	20
B	26	26	80
			Total 100

- Students are permitted to bring into the examination room: pens, pencils, highlighters, erasers, sharpeners, rulers, one scientific calculator, a protractor, a set square and aids for curve sketching.
- Students are NOT permitted to bring into the examination room: blank sheets of paper and/or correction fluid/tape.

Materials supplied

- Question and answer book of 25 pages
- Answer sheet for multiple-choice questions

Instructions

- Write your **student number** in the space provided above on this page.
- Check that your **name** and **student number** as printed on your answer sheet for multiple-choice questions are correct, **and** sign your name in the space provided to verify this.
- Unless otherwise indicated, the diagrams in this book are **not** drawn to scale.
- All written responses must be in English.

At the end of the examination

- Place the answer sheet for multiple-choice questions inside the front cover of this book.

Students are NOT permitted to bring mobile phones and/or any other unauthorised electronic devices into the examination room.

SECTION A – Multiple-choice questions**Instructions for Section A**

Answer **all** questions in pencil on the answer sheet provided for multiple-choice questions.

Choose the response that is **correct** or that **best answers** the question.

A correct answer scores 1; an incorrect answer scores 0.

Marks will **not** be deducted for incorrect answers.

No marks will be given if more than one answer is completed for any question.

Unless otherwise indicated, the diagrams in this book are **not** drawn to scale.

Question 1

When following safe manual handling procedures, which action is recommended?

- A. Bend at the knees.
- B. Lift using back muscles.
- C. Bend upper body forward.
- D. Keep load away from body.

Question 2

According to 5S principles, how should hand tools that are frequently used be stored?

- A. in a drawer under the workbench
- B. in the operator's toolbox in their locker
- C. on a shadow board above the workbench
- D. in a locked cabinet in the supervisor's office

Question 3

The most common Australian standard format for engineering drawings that show a component in different views is

- A. oblique.
- B. isometric.
- C. first-angle projection.
- D. third-angle projection.

Question 4

In the 5S system, which one of the following is a benefit of Sort?

- A. eliminates scrap product
- B. improves machine reliability and output
- C. improves quality of products for customers
- D. reduces time spent searching for work items

Question 5

Which one of the following is the smallest measurement?

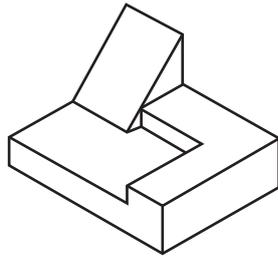
- A. 180 m
- B. 180 mm
- C. 180 cm
- D. 1 800 000 μm

Question 6

A machine produced 860 parts and 58 parts were found to be defective.

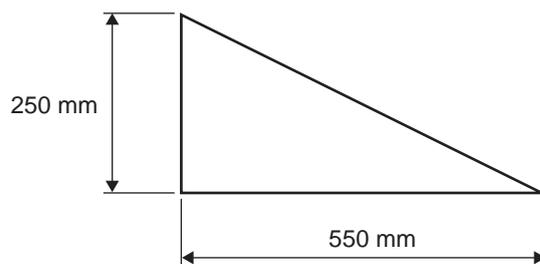
This represents a percentage defect rate of

- A. 5.8%
- B. 6.7%
- C. 8.6%
- D. 14.8%

Question 7

Which sketch represents the top view of the shape shown in the diagram above?

- A.
- B.
- C.
- D.

Question 8

Triangular pieces of metal of length 550 mm and width 250 mm, as shown above, will be guillotined from one sheet of sheet metal measuring 2.4 m \times 1.2 m.

What is the **maximum** number of triangular pieces that could be cut from the sheet?

- A. 16
- B. 32
- C. 36
- D. 42

Question 9

Based on the 5S system, red tagging is commonly used to

- A. lock out machines that are faulty.
- B. select equipment that needs cleaning.
- C. identify items that are not required in the area.
- D. group common tools that belong in the same area.

Question 10

Tolerances Unless otherwise stated: Diameters ± 0.05 Lengths ± 0.25 Finish 3.2μ	Name: Retainer plate Material: Mild steel
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What is the **maximum** width of the retainer plate shown above?

- A. 11.95 mm
- B. 12.00 mm
- C. 12.05 mm
- D. 12.25 mm

Question 11

A company practises recycling its waste material using bins.

Which material should be put in a bin labelled 'Ferrous material only'?

- A. steel
- B. brass
- C. plastic
- D. aluminium

Question 12

Which one of the photographs below shows the safest way to carry a 3 m long steel tube through a workshop?

on shoulder



raised at front



raised at rear



straight up

**Question 13**

Energy labels on appliances are a guide to help consumers purchase an appliance that

- A. will last the longest.
- B. is cost effective to run.
- C. is the cheapest to buy.
- D. is the easiest to install.

Question 14

When implementing 5S, part of the Sort step involves

- A. identifying all relevant work items.
- B. identifying the best location for items.
- C. cleaning up after the completion of work.
- D. working out who is responsible for cleaning the work area.

Question 15

In the waste management hierarchy, which one of the following is the most preferable or highest priority action according to the Environmental Protection Authority?

- A. re-use
- B. disposal
- C. treatment
- D. containment

Question 16

An example of standardising activities in the 5S system is

- A. keeping the work area neat and tidy at all times.
- B. everyone following a checklist when cleaning.
- C. recommending 5S improvements to the supervisor.
- D. all team members identifying the best location for items.

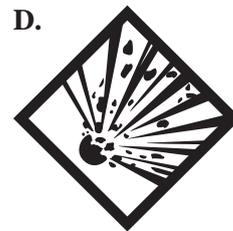
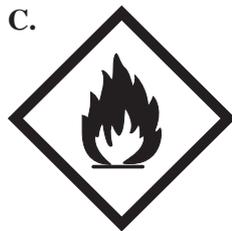
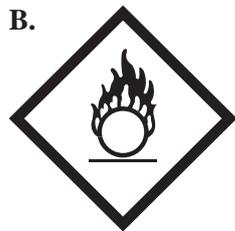
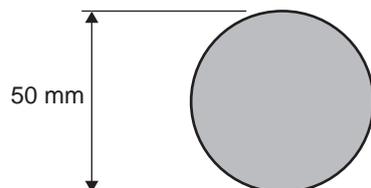
Question 17

Which of the following refers to the likelihood of a workplace injury occurring?

- A. accident
- B. incident
- C. hazard
- D. risk

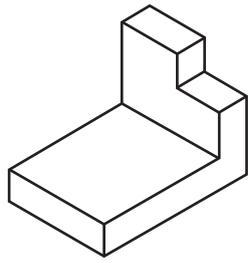
Question 18

Which one of the symbols below would be used where oxidising material is stored?

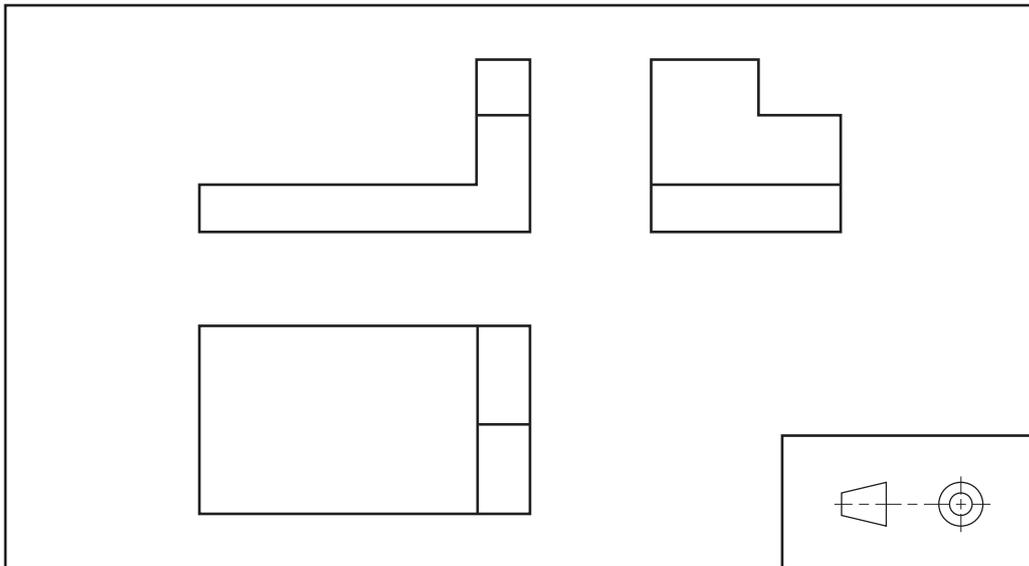
**Question 19**

What is the area of the circle shown above?

- A. 50 mm²
- B. 157 mm²
- C. 1963 mm²
- D. 7855 mm²

Question 20

The part shown above has been drawn in three orthographic views, as depicted below.



The three orthographic views are

- A. isometric.
- B. perspective.
- C. first-angle projection.
- D. third-angle projection.

SECTION B**Instructions for Section B**

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

All dimensions are in millimetres (mm) except where specified.

Unless otherwise indicated, the diagrams in this book are **not** drawn to scale.

Question 1 (3 marks)

Apart from using correct lifting technique, list three things that should be considered when planning to manually lift an object.

1. _____

2. _____

3. _____

Question 2 (2 marks)

What are two things that should be checked on a sling before using it to lift a heavy object?

1. _____

2. _____

Question 3 (2 marks)

Gloves are sometimes worn to protect the hands when working in an engineering workshop.

a. Identify **one** work activity that requires gloves. 1 mark

b. Identify **one** work activity where wearing gloves could be a potential safety risk. 1 mark

Question 4 (3 marks)

- a. Name **one** type of heavy lifting equipment in an engineering environment for which the operator requires a ticket/licence. 1 mark

- b. In Australia, there is no longer a prescribed weight limit for loads that are to be manually lifted. This is because the weight of an object is only one factor that **may** contribute to injury. Other than weight, name **two** factors that would increase the risk of strain and sprain injuries. 2 marks

Question 5 (2 marks)

A company is implementing the 5S system and wants to post cleaning schedules in all of its main manufacturing areas.

State **two** specific requirements of a cleaning schedule.

Question 6 (2 marks)

- a. How does recycling benefit the environment? 1 mark

- b. Apart from the benefit to the environment, why do companies practise recycling? 1 mark

Question 7 (2 marks)

Name **two** specific items in a typical engineering workshop that can be recycled.

Question 8 (2 marks)

Name **two** specific items in a typical office that can be recycled.

Question 9 (3 marks)

The following actions have been suggested for engineering workshops as ideas to help prevent and minimise environmental risks and reduce environmental impacts.

reduce recycle re-use recover repair

Complete the table below by identifying which action is being practised for each environmental change given.

Environmental change	Action
A company decides to collect the oil used during production processes.	
A company puts in solar panels to save on its power bills.	
A company packs its product in large cardboard boxes and its customers send the boxes back to be repacked.	

Question 10 (1 mark)

Calculate the revolutions per minute (RPM) for a Ø 10 mm drill using a cutting speed of 40 m/min.

$$\text{RPM} = \frac{300v}{d}, \text{ where } v = \text{cutting speed and } d = \text{diameter}$$

Question 11 (6 marks)

Figure 1 shows a metal component.

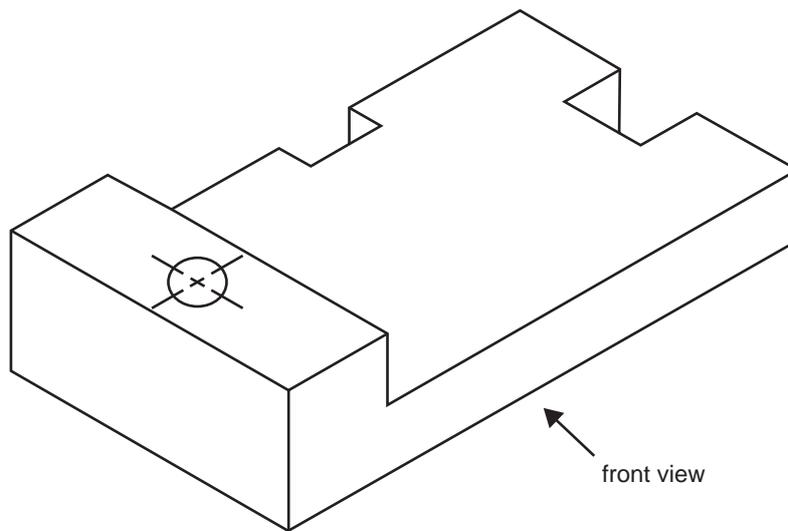
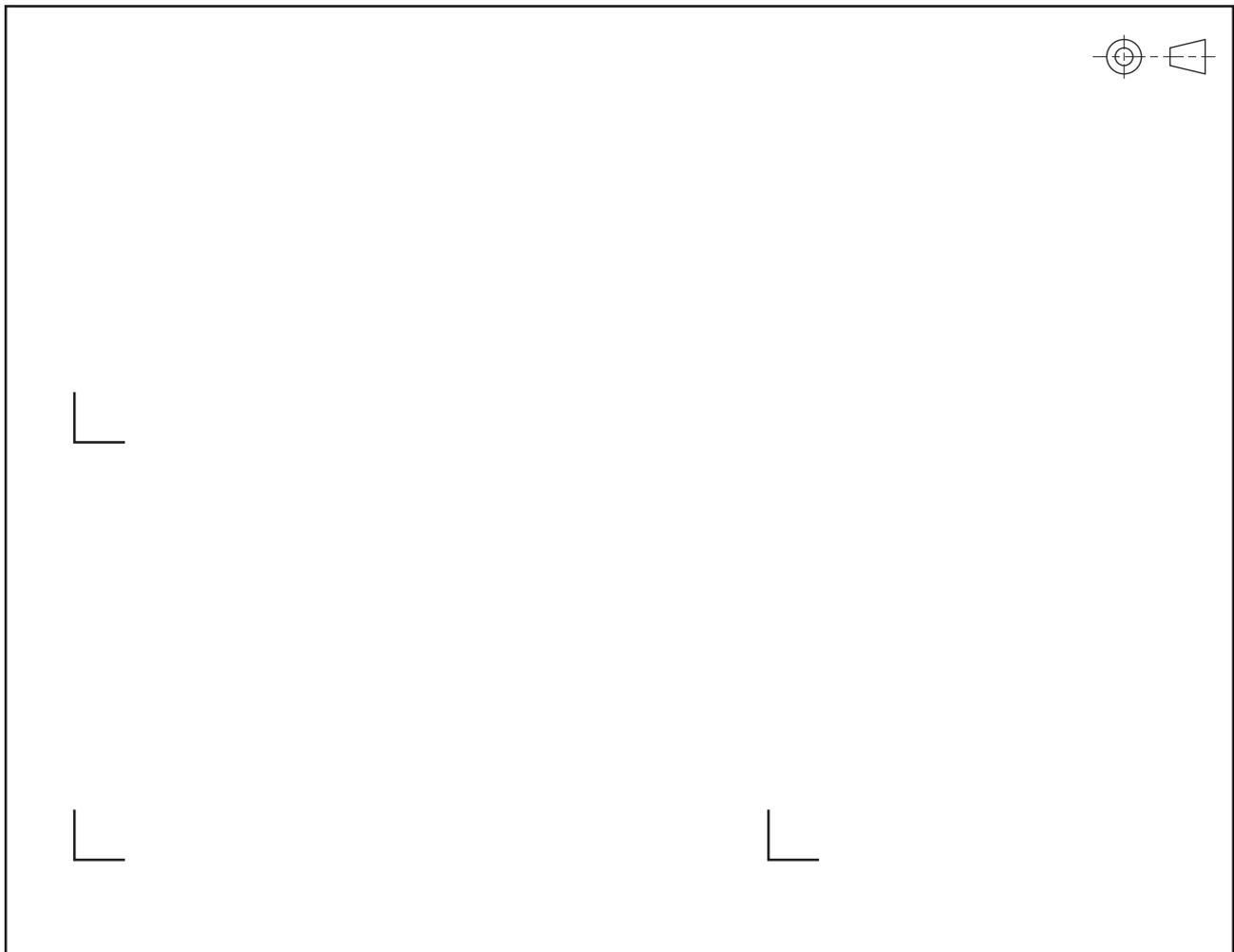


Figure 1

Sketch the metal component shown in Figure 1 in third-angle projection in the space provided below. Show **three** views (top, front and side), including all hidden lines.



Question 12 (5 marks)

Figure 2 shows a drawing of a machine slide.

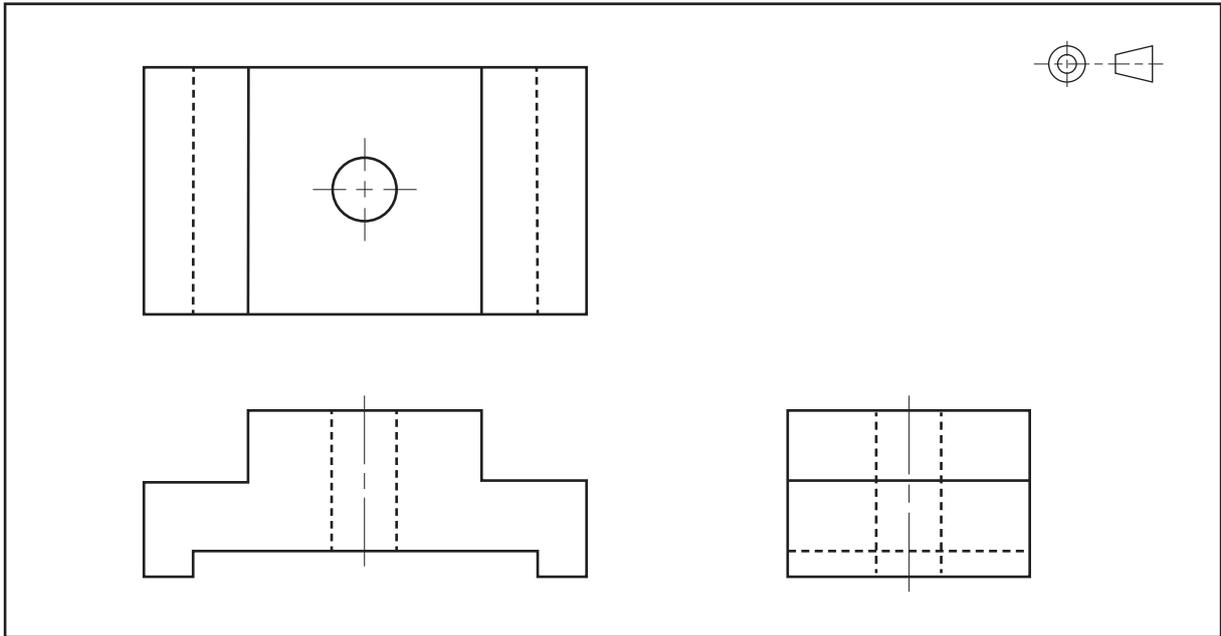


Figure 2

Sketch the machine slide shown in Figure 2 in isometric view in the space provided below. Show all centre lines.



CONTINUES OVER PAGE

Question 13 (10 marks)

Figure 3 shows a cabinet in a manufacturing area where the 5S system is about to be implemented. Four operators and a team leader will be involved in implementing the 5S system.



Figure 3

- a. Suggest **one** reason why the team leader should involve all of the operators when implementing the 5S system.

1 mark

- b. What is the first step in the 5S process?

1 mark

When going through the first step, the team decided that only the following items were needed in the manufacturing area:

- all of the tools (those on top of the cabinet and in the toolbox)
- the first-aid cabinet (the white box at the bottom of the cabinet)
- the rolls of tape
- the white chalk blocks

The team also decided that the cabinet should be removed from the manufacturing area because it was no longer needed for storage.

- c. Give **two** reasons why the empty cabinet should not be left in the manufacturing area. 2 marks

The team is now implementing the 5S step that involves finding the best location for the items kept and visually marking where the items belong.

- d. What is this step called? 1 mark

- e. Give **two** reasons why it is important to visually mark where the items belong. 2 marks

- f. Give **two** examples of how to visually mark where each item belongs. 2 marks

- g. Give **one** example of how the 5S system can save time in the workplace. 1 mark

Question 14 (2 marks)

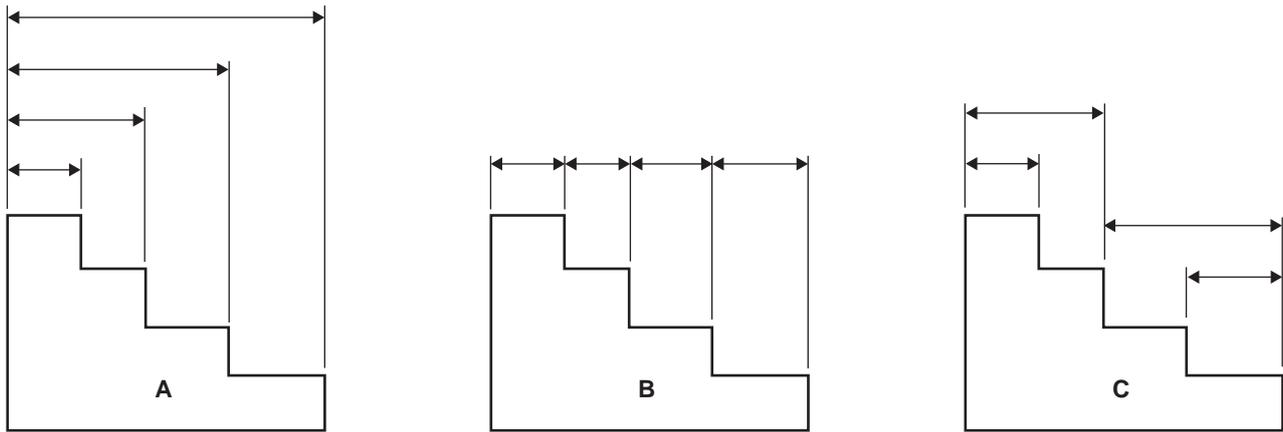
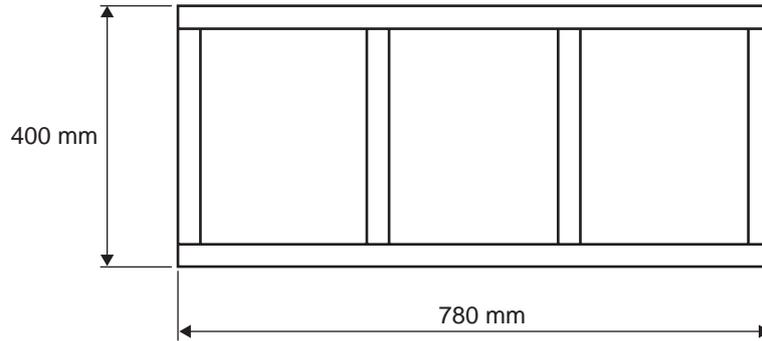


Figure 4

Referring to Figure 4, which of the shapes – A, B or C – is dimensioned correctly? Explain your answer.

Question 15 (6 marks)

The frame shown in Figure 5 will be made from 25 mm square tube, which comes in 6 m lengths.

**Figure 5**

- a. How many individual pieces of 25 mm square tube are required for each frame? 1 mark

- b. Calculate how many 6 m lengths of square tube are required to make 10 frames. Show your working. 3 marks

- c. Describe how the 6 m lengths of 25 mm square tube should be safely handled while cutting each length into the individual pieces of square tube required. 2 marks

Question 16 (2 marks)

The *Victorian Environmental Protection Act* is designed to prevent pollution and environmental damage.

Apart from air quality, name **two** key areas that the Act covers.

Question 17 (1 mark)



Figure 6

What does the symbol shown in Figure 6 mean?

Question 18 (4 marks)

Figure 7 shows a sheet metal lid for a bin. The lid will have a rubber edge strip put around all edges of the perimeter and around the hole.

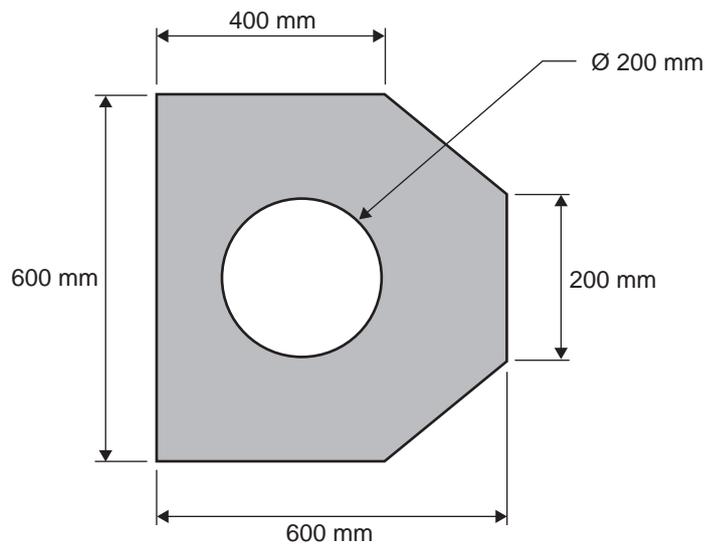


Figure 7

Calculate the length of rubber edge strip required for both the perimeter and the hole. Show your working.

Question 19 (2 marks)

Suggest **two** advantages for the workers of implementing the 5S system in an engineering company.

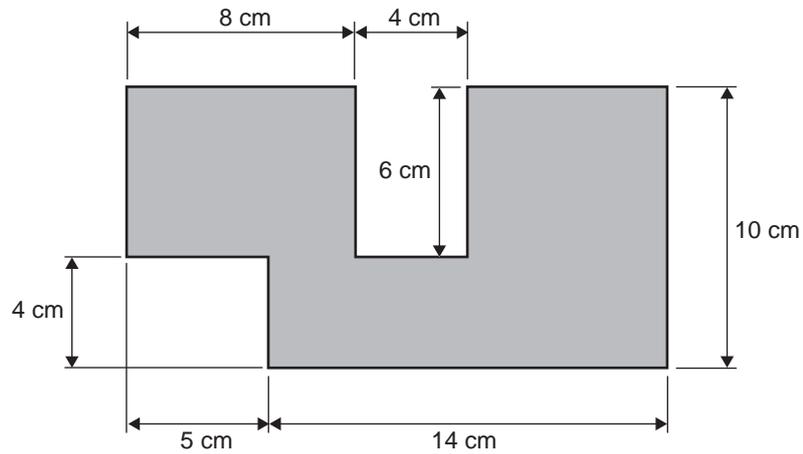
Question 20 (3 marks)

Figure 8

Calculate the shaded surface area shown in Figure 8. Show your working.

Question 21 (2 marks)

The graph in Figure 9 shows the cost of utilities to run a company over a 10-month period.

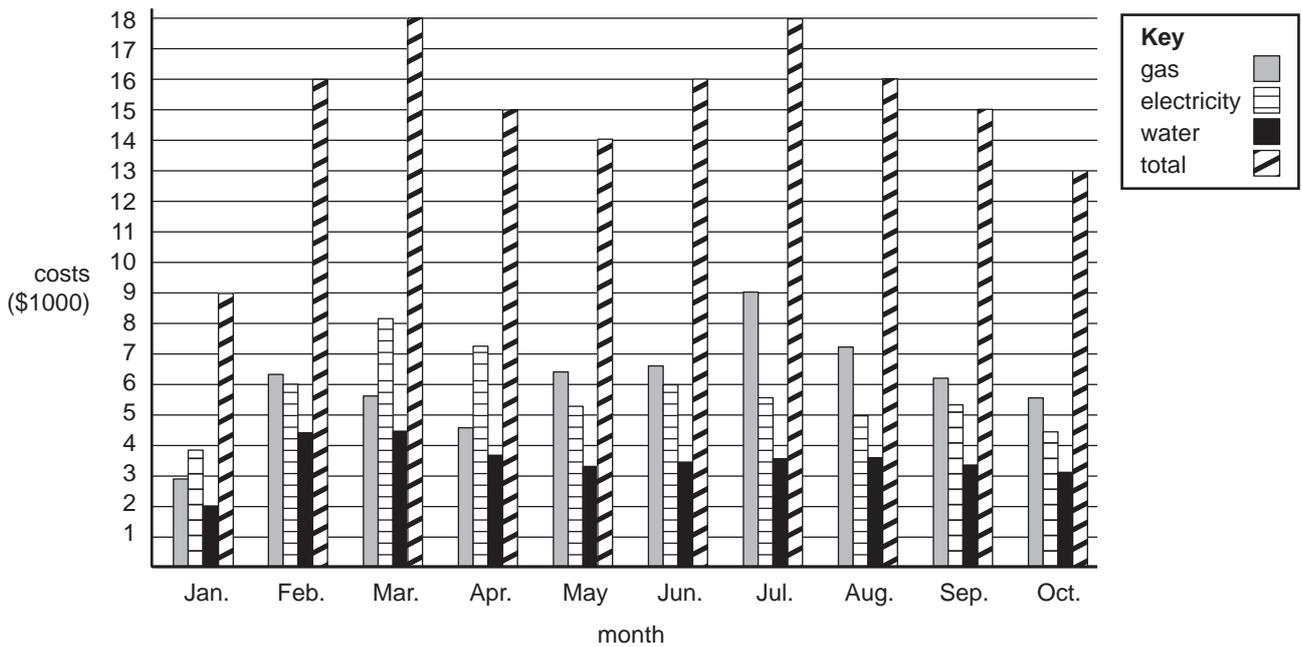


Figure 9

- a. Which utility represents the largest cost in the first six months of the year? 1 mark

- b. Calculate the total cost of all utilities, in dollars, over the 10-month period. 1 mark

Question 22 (3 marks)

A company sells gauges similar to the one shown in Figure 10 below. The company currently packs the gauges in cardboard boxes filled with polystyrene chips, as shown in Figure 11, to send out to its customers.



Source: Scanrail1/Shutterstock.com

Figure 10



Source: Christopher Elwell/Shutterstock.com

Figure 11

- a. Explain why the use of polystyrene is not environmentally friendly. 1 mark

- b. Suggest a more environmentally friendly packing material that could be used instead of polystyrene. Explain why this other material would be better for the environment. 2 marks

Question 23 (1 mark)

A reading of 86 dB was taken in an engineering workshop.

What was being measured?

Question 24 (6 marks)

An engineering company uses a degreaser to clean equipment parts. The label on the container of the degreaser is shown in Figure 12 below.

<p>Degreaser</p> <p>Contains: naphtha (petroleum), hydrodesulfurised heavy nonionic surfactants</p>		<p>10 L</p> <p>DANGER</p> <p>Flammable liquid and vapour</p> <p>May be fatal if swallowed and enters airways</p> <p>Causes mild skin irritation</p> <p>Causes serious eye damage</p> <p>Toxic to aquatic life, with long-lasting effects</p>
<p>A. </p>	<p>B. </p>	
<p>C. </p>	<p>D. </p>	
<p>IF SWALLOWED: Immediately call a POISON CENTRE or doctor.</p> <p>IF SWALLOWED: Rinse mouth. DO NOT induce vomiting.</p> <p>IF ON SKIN: Wash with plenty of soap and water.</p> <p>IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do so. Continue rinsing. If eye irritation occurs, get medical attention. If skin irritation occurs, get medical advice.</p> <p>Store locked up.</p> <p>Store in a dry place.</p> <p>Store in a closed container.</p> <p>Store in a well-ventilated place.</p> <p>Dispose of contents at an approved waste disposal plant and dispose of containers at a landfill.</p> <p>Manufactured by Chemical Company XYZ, 522 Chem Street, Chem Town, Chem State Telephone: 5555 5555</p>		<p>In case of fire, use carbon dioxide, dry chemical, foam. Alcohol-resistant foam is preferred.</p> <p>Keep out of reach of children.</p> <p>Keep away from heat sparks, open flames and hot surfaces – no smoking.</p> <p>Keep container tightly closed.</p> <p>Ground/bond container and receiving equipment.</p> <p>Do not get in eyes, on skin or on clothing.</p> <p>Wash contacted areas thoroughly after handling.</p> <p>Avoid release to the environment.</p> <p>Wear protective gloves, protective clothing and eye or face protection.</p> <p>Take precautionary measures against static discharge.</p> <p>Use explosion-proof electrical ventilating, lighting and other equipment.</p>

Figure 12

- a. State **two** purposes of having the degreaser label on the container. 2 marks

- b. There are four safety signs, labelled A. to D., on the degreaser label.
Select any two safety signs and state the meaning of each. 2 marks

Safety sign (A., B., C., D.)	Meaning

- c. What type of personal protective equipment (PPE) should be worn when using this degreaser? 1 mark

- d. Give **one** precaution to observe when storing this degreaser. 1 mark

Question 25 (1 mark)

A detergent is being mixed with water at a ratio of 15:1, water to detergent concentrate.

How much detergent is required when using 12 L of water?

Question 26 (4 marks)

The 5S audit form shown in Figure 13 was completed for a company that has started implementing the 5S system.

5S audit list		Unsatisfactory 0	Not bad 1	Average 2	Very good 3	Excellent 4	
1.	Red tags/sorting continues to be implemented				✓		17
2.	No unneeded tools, equipment, etc. are kept in area					✓	
3.	No unnecessary inventory is in area				✓		
4.	Correct levels of supplies (screws, etc.) are in area				✓		
5.	Personal belongings are correctly stored					✓	
6.	Aisles, workstations are clearly marked and identified		✓				10
7.	All tools, equipment, inventory are clearly identified and in their correct location			✓			
8.	Position of all moveable trolleys, bins, pallets is clearly marked		✓				
9.	Tools and equipment are positioned close to operators and easy to pick up and put away				✓		
10.	There are clear max./min. levels for supplies				✓		
11.	People clean habitually without being told			✓			10
12.	Cleaning includes checking for quality issues			✓			
13.	Responsibility for each cleaning area is clear to everyone		✓				
14.	All cleaning materials are easily accessible				✓		
15.	The whole workplace is sparkling clean			✓			
16.	Scrap/rubbish bins are emptied on a regular basis		✓				9
17.	Immediate action is taken if storage becomes disorderly			✓			
18.	5S audits are done on a regular basis				✓		
19.	Suggestions for improvement are regularly put forward by the team		✓				
20.	The first three steps of 5S have become habitual			✓			
21.	The manager is very active with regard to 5S		✓				6
22.	All of the workers are enthusiastic about 5S			✓			
23.	Regular 5S meetings are held by the team	✓					
24.	The team routinely checks work area for 5S		✓				
25.	5S action register is used and kept current			✓			
TOTAL							52/100

Figure 13

Based on the 5S audit form in Figure 13, suggest four important actions the company could take that would improve its 5S program.

1. _____

2. _____

3. _____

4. _____
