

DESIGN AND TECHNOLOGY

6187
Paper 1

General comments

A slight improvement for the 2021 candidates who scored more **A** symbols compared to the 2020 candidates, it was inevitably notice that most candidate opted for question 12 Resistant materials and very few centre opt for the other two options Communication(11) and Technology(13) questions. Overall sketching was the downfall for most candidates.

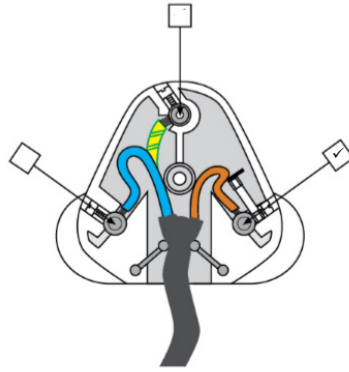
Comments on individual questions

Part A

Candidates needed to. Identify safety feature from the pillar drill this question was well answered by most candidates.

- 1 (a) - Wear Personal Protective Equipment (PPE), read the Safety Observation poster (SOP), tie up hair,
- Remove loose jewellery, remove chuck key,
- Secure work piece, lower safety guard,
- Know how to operate the drill (use appropriate drill speed)
Ensure the drill is in good working condition [2]
Well answered by mosts candidates
- (b) (i) - Safety plastic guard cover
- Emergency switch button
- Handle/control [1]
Safety feature refers to how the feature mentioned in (b)(i) could protect the user a part on the machine that's function is solely the safety of the user.
- (ii) - Avoid splints and swarf to injure someone. Swarf is the sharp metal waste material that is produced when drilling or cutting on a machine such as the pillar drill. It can cut a person's hand if touched, flying swarf dangerous to eyes, etc.
Enables the user to switch off the drill in case of emergency
Enables the user to have full control of the drill during operation (1 for any one correct answer) [1]
Possible accident that could be caused when the safety precautions in (a) are not obeyed.
- (c) - Splints to injure someone, mistakes may occur due to not reading the SOP, the hair & loose jewellery might get stuck in the moving parts of the drill.
- The chuck key, if left in the chuck of the drill can fly out when switched on and injure someone
- Unsecure workpiece can move while being worked on and lead the user to stumble into the drill
- Disengaged safety guard will not give protection from splints and swarf
- Not knowing how to use the drill might lead to accidents
- Out of order drill might injure the user or even get the drill entirely damaged.
(1 mark for the answer correlating with the one in 1 (a)) [1]
Safety hazard in the arrangement how the overload can be hazardous to the user. Some candidates answer referring to a benefit of using one plug instead of focusing on the hazards. This question was well answered by most of the candidates.
- 2 (a) - Overloading (can cause short circuit, fire, shock, damage plug)
- Damaged plug (sellotaped)
- Loose wires/uninsulated cables (any one) [1]
Well answered by some most but some candidates could not follow the instruction as it was requested through the question by ticking.

(b) (i)



Most candidates could not identify the wiring code or some only end up giving one color code. [1]

(ii) Green and yellow.

(1 mark each)

[2]

Well answered by most centre but there is some centre that the learners are not showing positive outcome on this question which is a concept that should have been taught from grade 8

3 The nature of art, beauty, and taste, with the creation and appreciation of beauty. [2]

Well answered by most candidtes.

4 (a) Wood name e.g. Oak, Pine, Dolf & any other suitable wood [1]

Metal: Mild steel & any other suitable metal [1]

(b)

3D sketch	1 mark
Rendering (shade, colour, texture etc.)	1 mark
Notes (inline)	1 mark
Relevance (Correct reinforcement)	1 mark

Clear indication was revealed that some centres could not comment positively or correct on this meaning of Anthropometric. While only few centres could correctly answer this question. [4]

5 **Anthropometric data.**

The science of measuring people/human body and provides data that can be used by designers. [2]

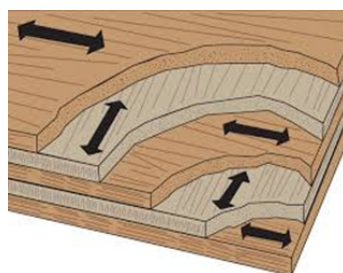
Most candidates did well in this question.

Ergonomics

- The study of the problems of people in adjusting to their environment; esp., the science that seeks to adapt work or working conditions to suit the worker.
- The study of the design of objects, systems and environments for their safe and efficient use by people [2]

Only few centres could correctly answer this part some candidates failed to come up with what was required to do and therefore most centres poorly performed in answering this question.

6 (a)



Only few centres could correctly answer this part some candidates failed to come up with what **was** required to do and therefore most centres poorly performed in answering this question. [3]

- (b) (i) Laminated/Block board and Chipboard/Pressboard/Particle board. [2]

This question was well answered by most centres.

- (ii) Wear PPE, Eye protections goggles and dust mask read SOP, tie up hair, remove loose jewellery, roll up long sleeves, secure workpiece [2]

Was well answered by most centres

7



Fig 6

Compression	<input type="checkbox"/>
Tension	<input type="checkbox"/>
Torsion.	<input checked="" type="checkbox"/>

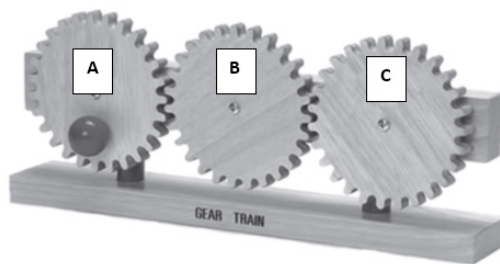
[1]

Most centres answered this part of the question paper correctly since it is a cross curriculum question they could relate the question to other subjects.

- 8 (a) - Forestry helps reduce catastrophic wildfires.
 - Forestry helps wildlife.
 - Forestry provides great places to recreate.
 - Forestry benefits urban environments.
 - Forestry is good for soils.
 - Forestry helps family forests stay intact.
 - Forestry provides renewable and energy-efficient building products.
 - Forestry benefits urban environments.
 - Prevent deforestation
 - Prevent desertification any three [3]
 Well answered

- (b) - Use earth-bags instead of plastic and paper bags.
 - Use of bio-fuels.
 - Use of biogas in our homes (any other) [3]
 Was well answered

9



IDLER	B
DRIVER	A
	C

5

Most candidates answered this question well however some candidates could not relate the answer to the reason why the metal should be able to make a sound instead of resist rust or corrode.

- 10 Materials: Iron, Brass, Aluminium, Magnesium (Any one) [1]
 Reason: They make a ringing sound, sonorous, hence their use in bell making. [1]
 [40]

Part B

Only few centres opted for this question and scored significantly good marks. Some candidates was not accurate however the a indication of understanding was revealed.

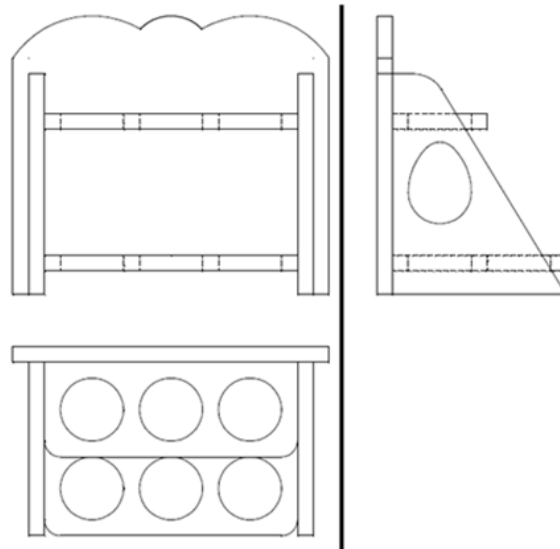
Understanding of Using a scale of 1:2,

Most candidates draw the three First Angle orthographic views of the egg rack.

Most candidates draw Front elevation in direction of arrow 'A'

- Most candidates End elevation in direction of arrow 'B'
- Plan elevation in direction of arrow 'C'
- Most candidates did not Include all hidden details

11 (a) (i)



Elevation -

- | | |
|---|----------|
| Setting out overall height (150 without curve) | [1 mark] |
| Showing overall width (200) | [1 mark] |
| Showing position, thickness (10) and height of sides | [1 mark] |
| Showing position and thickness of bottom/top shelf | [1 mark] |
| Showing hidden detail for holes in shelves (8+ lines) | [1 mark] |
| Locating centre and drawing back arc (60) either side | [1 mark] |
| Locating centre and drawing centre arc | [1 mark] |

- | | |
|---|----------|
| Setting out/transferring height (with curve) | [1 mark] |
| Setting out depth (120) | [1 mark] |
| Drawing corner of arc on back (150) | [1 mark] |
| Drawing hidden line for centre arc on back | [1 mark] |
| Showing thickness of back | [1 mark] |
| Position thickness and width of either shelf | [1 mark] |
| Locating height of side | [1 mark] |
| Drawing angle of side | [1 mark] |
| Locating centre and drawing radius on side (20) | [1 mark] |
| Drawing egg cut out (4 arcs) | [1 mark] |

- | | |
|--|----------|
| Setting out overall width (200) | [1 mark] |
| Setting out overall depth (120) | [1 mark] |
| Thickness of back (10) | [1 mark] |
| Position and thickness of either side (10) | [1 mark] |
| Width of shelves (60/110) | [1 mark] |
| Find centre and draw holes (3+) | [1 mark] |
| Drawing of fillets (any) | [1 mark] |
| General - Draughtsmanship, presentation... | [1 mark] |

[25]

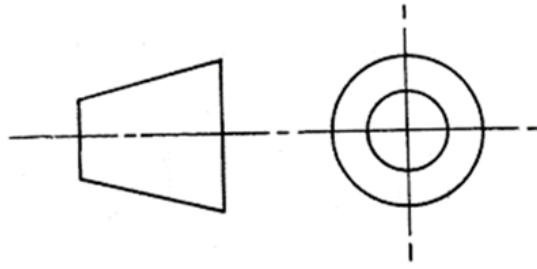
Candidates share common understanding of this question but the majority could not apply the prescribed ISO standard dimensions.

- (ii) Dimensions inserted as prescribed by ISO standards (Each elevation to have its two important dimensions)

[6]

Most candidates did well in answering this question

(iii)



[2]

Only few learners could apply enhancement showing wood grain.

(iii) Enhance the drawing to show that the egg rack is made from wood.

[4]

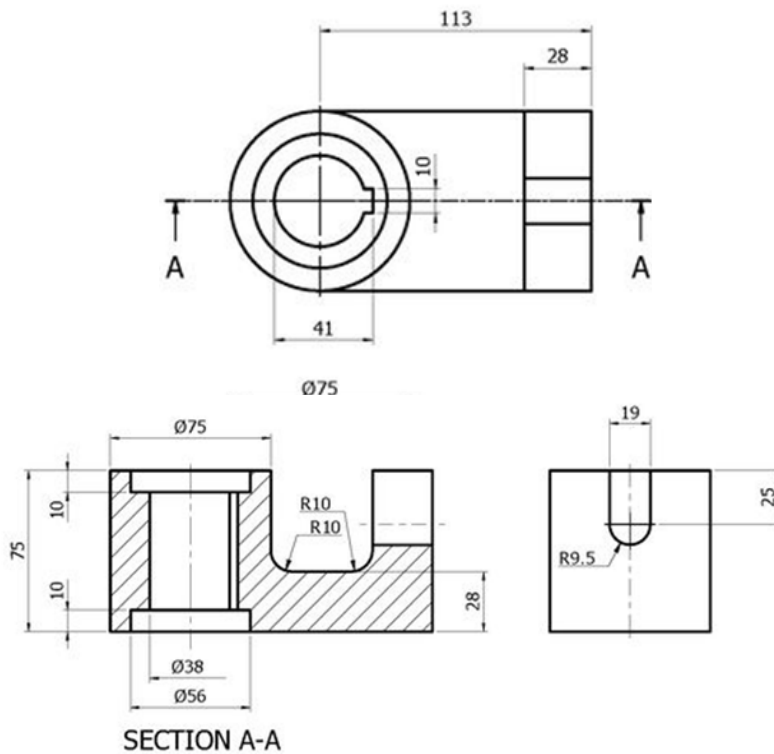
(b) (i)

Description	Quantity	Length	Height	Thickness
Sides	2	135	95	15
Shelf	1	200	105	15
Handle	1	200/230	80	15

[11]

Not all candidates could fully answer the question how ever there was a good understanding on what was expected from them.

(c)



- uncut inner rims (top + bottom) – 2
- hole – 1
- 2 x cut surfaces – 2
- spline groove – 1
- size – 2
- method of sectioning – 2
- rio curves shown – 2

[12]

[60]

This was the most answered question by the centres as a option. Not all questions was well answered in this part question some learners did not apply the correct answers to the questions.

Draw the development that would be marked out on an acrylic sheet in order to manufacture the letter holder most drawings/sketches was incomplete with poor drawing/sketching skills.

12 (a) (i)

Neat & well-proportioned sketch of development	1 mark
Correct cutting pattern and folding lines (4 folding lines)	1 mark
Surfaces (must be five surfaces)	1 mark
Filletts	1 mark

[4]

Most drawings/sketches was incomplete with poor drawing/sketching skills.

(ii)

Sketches (neat, relevant & well proportioned)	2 marks
Notes/description of the correct steps (secure acrylic in vice with waste wood underneath/ place tape on front and back; mark centres; select appropriate sized drill bit; use low speed and slow feed drill through the acrylic; use a countersink bit to allow the screw head to sit flush with the surface of the acrylic)	3 marks

[5]

Most drawings/sketches was incomplete with poor drawing/sketching skills.

(iii) Drilling two large holes...

Sketches (neat, relevant & well proportioned)	1 marks
Notes/description of the correct steps (secure acrylic in vice with waste wood underneath/ place tape on front and back; mark centres/find centres and draw circles on acrylic; use a hole saw set drill to low speed; drill through slowly from each side/drill series of holes inside the circumference; insert scroll saw, fretsaw blade through the hole and saw to the line; file to line with (half) round file)	3 marks

[4]

(iv) Engravings, painting, adjustment, & using router to shape the edges with suitable router bit profile will ensure improvement on the appearance.

[2]

Well answerd by most centres

(b) (i) Rack and Pinion Gear.

[1]

- (ii) - Used in the steering system of cars
 - Car gearboxes.
 - DVD drive in computers
 - Electric gates with mechanism etc.

(any two) [2]

Most drawings/sketches was incomplete with poor drawing/sketching skills.some instances irrelevant joints. It is encourable to use proper rendering and colour and shading.

(c) (i)

3D sketch	1 mark
Rendering (shade, colour, texture etc.)	1 mark
Notes (description)	1 mark
Relevance (joint suitability)	1 mark
Joint name (Housed, Dowelling, Biscuit joint, Bridle, Plugged/concealed screws etc.)	1 mark

[5]

Most learners could not answer this question the way it was expected.

(ii) Any one of the following:

Fixing paper or tape on reverse side of plywood

Choose the right kind & sharp blade to get a smooth cut on a sheet of plywood

Secure the whole piece of wood & cut with the good side down.

[2]

The question was answered partly by most candidates. Candidates made choices The majority could not answer the purpose / uses of their choice/ chisels

- (d) (i) Any two chisels chosen with the appropriate explanation. [6]
Well answered by most centres who opt for this question.
- (ii) Protection of wood from splitting/keep it in place [2]
Candidate show skills aid of neat freehand sketches, descriptive in detail how the seat is attached to the metal leg.
- (e) (i) Suitable sketch & description award marks that are in line with procedures. [2]
Well answered by most candidates.
- (ii) Exterior metal finish
Reasons in with exterior use include resistant to sun and wind and weather, as well as for aesthetics (any two) [3]
Not all candidates could make the difference between the plastics type how ever there was a fair amount in total by centres who show some understanding on different plastics.
- (f) Thermosetting plastic thermoset plastics and polymers include epoxy, silicone, polyurethane and phenolic. In addition, some materials such as polyester can occur in both thermoplastic and thermoset versions. Thermosetting Plastics are polymer material or substances which are malleable at low temperature and became hard at higher temperature. These plastics moulded ones and can be softened by heating. Bakelite and melamine are some examples of thermosetting plastics.

The main thermosetting plastics are epoxy resin, melamine formaldehyde, polyester resin and urea formaldehyde. Good electrical insulator, hard, brittle unless reinforced, resists chemicals well. Used for casting and encapsulation, adhesives, bonding of other materials. [4]

This question was well answered.

(g)

Metal	Ferrous	Non-Ferrous
Copper		✓
Cast Iron	✓	
Zinc		✓
Brass		✓
Mild Steel	✓	

[5]

- (h) (i) Most drawings/sketches was incomplete with poor drawing/sketching skills and few relevant,descriptive notes.

3D sketch	1 mark
Rendering (shade, colour, texture etc.)	1 mark
Notes (inline)	1 mark
Relevance (correct joints)	1 mark

[4]

- (ii) Most drawings/sketches was incomplete with poor drawing/sketching skills and few relevant,descriptive notes.

3D sketch	1 mark
Rendering (shade, colour, texture etc.)	1 mark
Notes (inline)	1 mark
Relevance (addition of storage)	1 mark

[4]

- (iii) Most drawings/sketches was incomplete with poor drawing/sketching skills and few relevant,descriptive notes.

3D sketch	1 mark
Rendering (shade, colour, texture etc.)	1 mark
Notes (inline)	1 mark
Relevance (appearance improvement)	1 mark

[4]

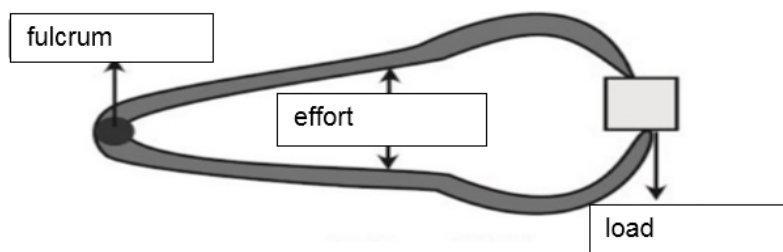
[60]

This part question was poorly answered and almost 90% centres did not opt for this question. Was well answered but some did not follow the instruction on were to apply the answer.

13 (a) (i) Anti-clockwise arrow drawn on the diagram [1]
Well answered

(ii) It makes other gears to rotate. Anti-clockwise for gear B, and clockwise for gear C. [1]

(b) (i)



[3]

(ii) Spur gear [1]

Only few candidates could answer this question correctly

(iii) Speed (rpm) = rpm of the driver gear x velocity ratio [3]
120 rpm x 2/3
80 rpm
Was well answered

(c) (i) A: Torsion/twisting force. [3]
B: Shearing force
C: Tensional force
Well answered

(ii) A: deform the metal/make metal weak/torsion [3]
B: cutting the metal/shearing
C: it cause stress over the metal/stretches the molecule structure of the metal
Fairly answered

(d) (i) Oscillating movement/motion [1]
Poorly answered

(ii) Designer should consider safety information to the user; Maintenance as well as weight limitations to the product. (any two) [2]
Poorly answered

(e) - correct method drawing of triangulation shown on both sides (1 mark each) [2]

This question was poorly answered by most candidates.

(f) (i) - Use to generate delays
- Use to generate a clean pulse of the correct height and duration of digital system
- Use to turn on or off external components for specific length of time
This question was poorly answered by most candidates.

(ii) R1 is necessary to prevent pins 6 and 7 ✓ from being directly connected to the positive voltage supply ✓ when VR1 is set to 0 Ω. ✓
This question was poorly answered by most candidates.

(iii) An increase of C1 will increase the RC time constant ✓ of the circuit keeping the output at a 'high' or 'on' state for longer. ✓
This question was poorly answered by most candidates.

(iv) When S1 is pressed, the input voltage on pin 2 will pulled down to 0 V. ✓ This triggers the 555 IC ✓ setting the output voltage at pin 3 and pin 7 to high. ✓ Once the capacitor voltage VC1 reaches 2/3 of the supply voltage ✓, it will immediately trip the internal timing circuit to reset the output pin 3 to low or 0 V returning to its stable state. ✓
This question was poorly answered by most candidates.

- (g) (i) $C = \frac{1}{2\pi f X_C}$
 $= \frac{1}{2\pi \times 50 \times 27}$
 $= 117,89 \mu\text{F}$
This question was poorly answered by most candidates.
- (ii) The current flow would increase through the capacitor. ✓ If the frequency of the supply is increased the capacitive reactance will decrease ✓ as it is indirectly proportional to the frequency of the supply. [3]
This question was poorly answered by most candidates.
- (h) (i) Inverting ✓
summing amplifier ✓ [2]
This question was poorly answered by most candidates.
- (ii) Negative feedback [1]
This question was poorly answered by most candidates.
- (iii) The gain of the amplifier is determined by the ratio ✓ of the feedback r ✓ resistor to the input resistance ✓ of each branch. [3]
This question was poorly answered by most candidates.
- (iv) $V_{\text{OUT}} = -(V_1 + V_2 + V_3)$
 $V_{\text{OUT}} = -(850 \text{ mV} + 200 \text{ mV} + 950 \text{ mV})$
 $V_{\text{OUT}} = -2 \text{ V}$ [3]
This question was poorly answered by most candidates.
- (v) The function of a differentiator is to change a square wave ü into a triangular wave. ü [2]
This question was poorly answered by most candidates.
- (I) Pin 6 (threshold) sets the voltage ✓ at which the 555 IC will trigger [2]
This question was poorly answered by most candidates.
- (i) (i) Smooth starting and running. Capable of transmitting power around corner or out of plane drive. Require very little maintenance. [1]
This question was poorly answered by most candidates.
- (ii) round belt, flat belt, toothed belt
This question was poorly answered by most candidates.
- (iii) Advancements in rubber technology rubber can crack get dry and brittle. Under ideal conditions, a belt should stick with you for an average of 60,000 to 100,000 km. [2]
This question was poorly answered by most candidates.
- (iv) - Rubber belts will harden, develop cracks and “chunk out” in pieces.
Misalignment [2]
This question was poorly answered by most candidates.
- (v) - switch of the power
- remove the cover by loosening lock screws
- release belt tension
- remove old belt
- replace the old belt with new belt
- adjust tensioner and put on the screw
- switch on the machine to test [4]
This question was poorly answered by most candidates.
- (j) Regular chain maintenance is important to obtain maximum life. In a correctly sized and installed drive, chain can be expected to last for approximately 15,000 hours (lubrication) [2]

[60]