GATE Agricultural Engineering

Sample Paper – 7

Duration: 128 Minutes **Maximum Marks: 72**

Instructions

- This paper contains **46 questions** covering the core **Agricultural Engineering** subject of the GATE paper conducted by the IITs and IISc (General Aptitude and Engineering Mathematics are provided as separate papers).
- **Q1–Q20 carry 1 mark each** and **Q21–Q46 carry 2 marks each**, for a total of **72 marks**.
- Each question carries **negative marking of one-third of its allotted marks**: a wrong 1-mark question costs **0.33** and a wrong 2-mark question costs **0.67**. Unattempted questions carry no penalty.
- Every question here is a single-correct **MCQ**. The real GATE paper also has Multiple Select (MSQ) and Numerical Answer Type (NAT) questions, and **those carry no negative marking**.
- Attempt this paper in one timed sitting of about **128 minutes**, the share this core subject earns at GATE's overall pace of 180 minutes for 65 questions. Take $g = 9.81$ m/s^2, density of water $\rho_w = 1000$ kg/m^3 and unit weight of water $\gamma_w = 9.81$ kN/m^3 unless stated otherwise.

Farm Machinery & Power

Q1. A tractor drive wheel has a theoretical (no-slip) forward speed of 6 km/h, but its actual measured forward speed is 4.8 km/h. The wheel slip is: [1 mark]

(A) 25%

(B) 20%

(C) 80%

(D) 5%

Q2. An engine pulley of diameter 150 mm running at 1000 rpm drives a machine pulley of diameter 300 mm through a flat belt (assume no slip). The rotational speed of the machine pulley is: **[1 mark]**

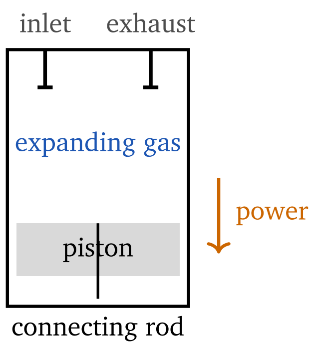
(A) 1000 rpm

(B) 500 rpm

(C) 2000 rpm

(D) 250 rpm

Q3. The sketch shows a four-stroke engine cylinder during its power (expansion) stroke. During this stroke the inlet valve and the exhaust valve are respectively: **[1 mark]**



(A) both closed

(B) both open

(C) inlet open, exhaust closed

(D) inlet closed, exhaust open

Q4. A tractor engine consumes 8 kg of diesel per hour while developing a brake power of 32 kW. The brake specific fuel consumption (BSFC) of the engine is: **[1 mark]**

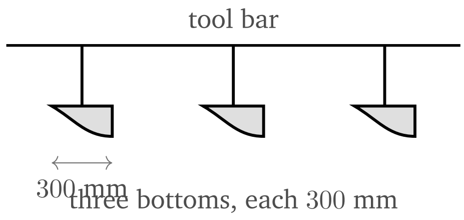
(A) 4.0 kg/kWh

(B) 0.50 kg/kWh

(C) 0.25 kg/kWh

(D) 40 kg/kWh

Q5. A three-bottom mouldboard plough is shown, with each bottom cutting a furrow slice 300 mm wide. Assuming the bottoms cut side by side without overlap, the total width of cut of the plough in one pass is: **[1 mark]**



(A) 0.90 m

(B) 0.30 m

(C) 3.0 m

(D) 0.60 m

Q6. An implement whose entire weight is carried by the tractor's hydraulic three-point linkage, with none of its weight resting on ground wheels, is classified as a: **[1 mark]**

(A) trailed implement

(B) semi-mounted implement

(C) ground-wheel implement

(D) mounted (integral) implement

Q7. A tillage implement requires a draft of 8 kN and is pulled at a uniform forward speed of 3.6 km/h. The drawbar power required to pull it is: **[1 mark]**

(A) 8.0 kW

(B) 2.22 kW

(C) 28.8 kW

(D) 4.0 kW

Q8. A field of area 4 ha is to be ploughed by an implement having an effective field capacity of 0.5 ha/h. The time required to plough the whole field is: **[1 mark]**

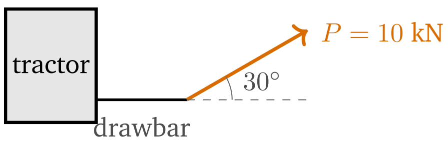
(A) 2 h

(B) 0.125 h

(C) 4 h

(D) 8 h

Q9. A hitch pull of 10 kN acts on a tractor drawbar at an angle of 30° above the horizontal, as shown. The vertical component of this pull is (take $\sin 30^\circ = 0.50$): **[1 mark]**



(A) 8.66 kN

(B) 5.0 kN

(C) 10.0 kN

(D) 2.5 kN

Q10. A field sprayer has a boom width of 10 m, travels at a forward speed of 5 km/h, and discharges liquid at a total rate of 25 L/min. The volume of spray applied per hectare is: **[1 mark]**

(A) 150 L/ha

(B) 300 L/ha

(C) 500 L/ha

(D) 250 L/ha

Q11. In a grain combine harvester, the component that separates the loose grain from the straw after threshing (letting grain fall through while the straw is walked out of the machine) is: **[1 mark]**

(A) straw walker

(B) cutter bar

(C) pick-up reel

(D) grain tank

Q12. The ratio of the total cylinder volume at bottom dead centre to the clearance volume at top dead centre of an engine is called the: **[1 mark]**

(A) cut-off ratio

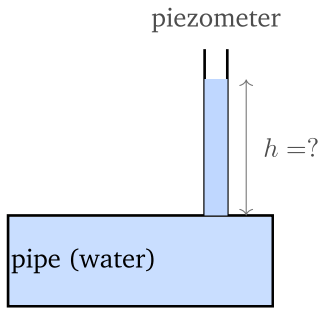
(B) expansion ratio

(C) compression ratio

(D) stroke-to-bore ratio

Soil & Water Conservation Engineering

Q13. The gauge pressure recorded at a point in a water pipe is 49.05 kPa. The corresponding height of water column (pressure head) that would register on the piezometer shown is (take $\gamma_w = 9.81$ kN/m^3): **[1 mark]**



(A) 5.0 m

(B) 10.0 m

(C) 2.5 m

(D) 0.5 m

Q14. Water flows through a channel of cross-sectional area 0.02 m^2 carrying a steady discharge of 0.04 m^3/s. The mean velocity of flow is: **[1 mark]**

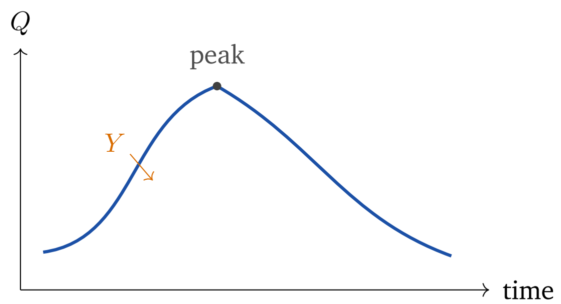
(A) 0.5 m/s

(B) 2.0 m/s

(C) 0.0008 m/s

(D) 8.0 m/s

Q15. In the single-peaked storm hydrograph shown, the portion marked Y (the part of the curve before the peak, where the discharge rises steeply) is called the: **[1 mark]**



(A) rising limb

(B) recession (falling) limb

(C) base flow

(D) crest segment

Q16. The maximum rate at which a soil in a given condition can absorb water through its surface is called its: **[1 mark]**

(A) percolation rate

(B) runoff coefficient

(C) saturated hydraulic conductivity

(D) infiltration capacity

Q17. In the Universal Soil Loss Equation $A = R\,K\,LS\,C\,P$, the factor that accounts for the combined effect of slope length and slope steepness is: **[1 mark]**

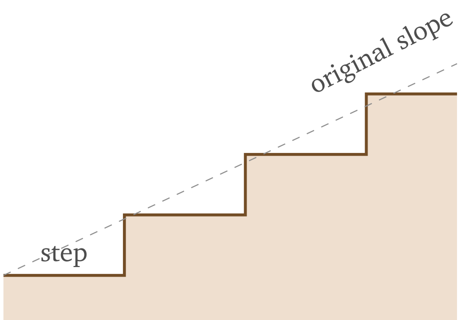
(A) R

(B) LS

(C) C

(D) P

Q18. The soil and water conservation measure shown, in which a steep hillslope is reshaped into a series of nearly level steps to reduce the effective land slope, is called a: **[1 mark]**



(A) graded bund

(B) grassed waterway

(C) bench terrace

(D) check dam

Q19. A watershed has a drainage area of 24 km^2 and an axial basin length of 8 km. The form factor of the watershed, defined as $F = A/L^2$, is: **[1 mark]**

(A) 0.75

(B) 0.375

(C) 3.0

(D) 0.267

Q20. The fraction of the incoming sediment load that is retained (deposited) within a reservoir, rather than passing out through the outlet, is termed the: **[1 mark]**

(A) trap efficiency

(B) sediment delivery ratio

(C) runoff coefficient

(D) erodibility index

Soil & Water Conservation Engineering (continued)

Q21. For an agricultural field the Universal Soil Loss Equation factors are $R = 300$, $K = 0.25$, $LS = 2.0$, $C = 0.20$ and $P = 1.0$ (in consistent units). The average annual soil loss A from the field is: **[2 marks]**

(A) 30 t/ha/yr

(B) 15 t/ha/yr

(C) 60 t/ha/yr

(D) 7.5 t/ha/yr

Q22. A catchment of area 90 ha has a runoff coefficient of 0.40. For a design rainfall intensity of 5 cm/h, the peak runoff estimated by the rational method $\left(Q = CiA/360,\ i \text{ in mm/h},\ A \text{ in ha}\right)$ is nearest to: **[2 marks]**

(A) 12.5 m^3/s

(B) 2.5 m^3/s

(C) 5.0 m^3/s

(D) 10.0 m^3/s

Q23. A storm delivers 80 mm of rainfall over a 25 ha watershed whose runoff coefficient is 0.30. The total volume of direct surface runoff produced is: **[2 marks]**

(A) 12000 m^3

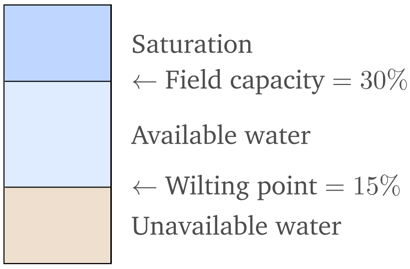
(B) 6000 m^3

(C) 3000 m^3

(D) 20000 m^3

Irrigation & Drainage Engineering

Q24. A soil has field capacity 30% and permanent wilting point 15% (both on mass basis), as marked on the moisture bar shown. The dry bulk density is 1.4 g/cm^3 and the crop root-zone depth is 1.0 m. If irrigation is scheduled when 40% of the available water has been depleted, the net depth of irrigation water to be applied (the readily available moisture) is: **[2 marks]**



(A) 210 mm

(B) 84 mm

(C) 126 mm

(D) 42 mm

Q25. A crop has a base period of 120 days and a duty of 864 hectares per cumec at the field. The delta (total depth of water required by the crop over its base period) is $\left(\Delta \text{ in m} = 8.64\, B/D,\ B \text{ in days},\ D \text{ in ha/cumec}\right)$: **[2 marks]**

(A) 0.6 m

(B) 2.4 m

(C) 1.2 m

(D) 1.0 m

Q26. During an irrigation, 100 mm depth of water is delivered to a field, of which 15 mm is lost to deep percolation and 5 mm to surface (tail) runoff, and the remainder is stored in the crop root zone. The water-application efficiency is: **[2 marks]**

(A) 20%

(B) 80%

(C) 95%

(D) 125%

Q27. Over a rainfall event lasting 4 hours, the cumulative depth of water that infiltrates into a soil is measured as 60 mm. The average infiltration rate over this period is: **[2 marks]**

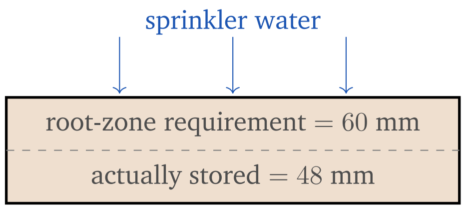
(A) 240 mm/h

(B) 60 mm/h

(C) 4 mm/h

(D) 15 mm/h

Q28. A sprinkler system is expected to store 60 mm depth of water in the crop root zone, but after an irrigation only 48 mm is actually found stored there (the rest running off or evaporating before infiltrating), as sketched. The water-storage efficiency of this irrigation is: **[2 marks]**



(A) 125%

(B) 20%

(C) 60%

(D) 80%

Q29. A pump lifts 50 L/s of water against a total head of 12 m. The water (output) power, i.e. the power actually imparted to the water, is (take $\rho_w = 1000$ kg/m^3, $g = 9.81$ m/s^2): **[2 marks]**

(A) 7.85 kW

(B) 11.77 kW

(C) 5.89 kW

(D) 4.42 kW

Q30. A centrifugal pump develops a head of 20 m when driven at 1450 rpm. If the speed is increased to 2900 rpm, the head developed by the pump, predicted by the affinity law $H \propto N^2$, becomes: **[2 marks]**

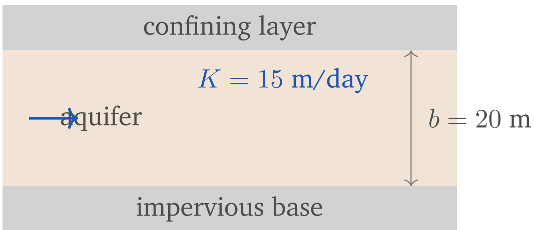
(A) 20 m

(B) 40 m

(C) 160 m

(D) 80 m

Q31. The confined aquifer shown has a hydraulic conductivity of 15 m/day and a saturated thickness of 20 m. The transmissivity of the aquifer is: **[2 marks]**



(A) 300 m^2/day

(B) 0.75 m^2/day

(C) 35 m^2/day

(D) 3000 m^2/day

Q32. A drainage coefficient of 1.25 cm/day is to be provided for a low-lying agricultural area of 100 ha. The design discharge capacity of the drainage system is nearest to: **[2 marks]**

(A) 1.157 m^3/s

(B) 0.579 m^3/s

(C) 0.289 m^3/s

(D) 0.145 m^3/s

Q33. In an irrigation project the conveyance efficiency of the canal network is 80% and the field-application efficiency is 75%. The overall (project) irrigation efficiency is: **[2 marks]**

(A) 60%

(B) 77.5%

(C) 105%

(D) 53.3%

Q34. Groundwater flows through a confined aquifer of cross-sectional area 50 m^2 and hydraulic conductivity 20 m/day under a hydraulic gradient of 0.01. The discharge of groundwater through the aquifer is: **[2 marks]**

(A) 10 m^3/day

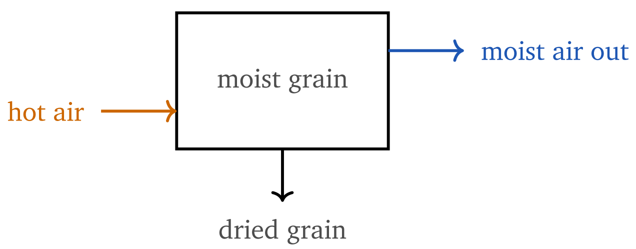
(B) 0.1 m^3/day

(C) 1000 m^3/day

(D) 100 m^3/day

Agricultural Processing & Food Engineering

Q35. A grain sample weighs 250 g in its moist state and 200 g after it has been dried completely (bone dry) in the hot-air dryer sketched. The moisture content of the original sample on a wet basis is: **[2 marks]**



(A) 25%

(B) 50%

(C) 20%

(D) 16.67%

Q36. A grain sample is found to contain 40 g of water and 160 g of bone-dry matter. The moisture content of the sample on a dry basis is: **[2 marks]**

(A) 20%

(B) 40%

(C) 160%

(D) 25%

Q37. A grain has a moisture content of 20% on a wet basis. The equivalent moisture content of the grain on a dry basis is: **[2 marks]**

(A) 20%

(B) 16.67%

(C) 25%

(D) 80%

Q38. During drying, the moisture content at which the drying behaviour changes from the constant-rate period to the falling-rate period (i.e. the drying rate first begins to drop below its constant value) is called the: **[2 marks]**

(A) equilibrium moisture content

(B) bound moisture content

(C) free moisture content

(D) critical moisture content

Q39. According to Kick's law of size reduction, the energy required per unit mass to reduce the size of a solid material is proportional to: **[2 marks]**

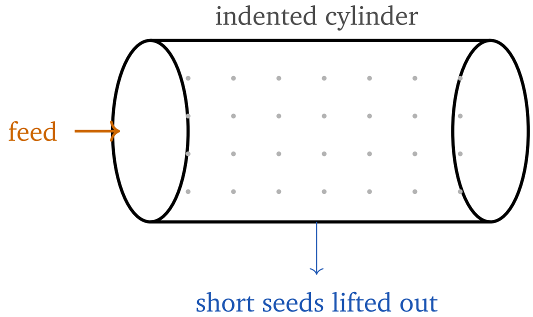
(A) the new surface area created

(B) the square of the feed particle size

(C) the reciprocal of the product particle diameter

(D) the logarithm of the size-reduction ratio, $\ln(d_1/d_2)$

Q40. The indented cylinder separator sketched is used to sort a mixture of seeds. It separates the seeds primarily on the basis of their: **[2 marks]**



(A) colour

(B) density

(C) length

(D) surface texture

Q41. A bucket elevator carries grain in buckets that each hold 2 kg of grain, and 30 buckets discharge at the head every minute. Operating at full load, the conveying (handling) capacity of the elevator is: **[2 marks]**

(A) 60 t/h

(B) 1.2 t/h

(C) 7.2 t/h

(D) 3.6 t/h

Q42. Heat is conducted steadily through a plane slab of thickness 0.05 m and thermal conductivity 0.2 W/m·K. The slab has a face area of 3 m^2, and its two faces are held at 80°C and 30°C. The rate of heat conduction through the slab is: **[2 marks]**

(A) 150 W

(B) 300 W

(C) 600 W

(D) 1200 W

Q43. In a food-processing unit, 5 kg of water is to be heated from 20°C to 60°C. Taking the specific heat of water as 4.2 kJ/kg · K, the quantity of heat required is: **[2 marks]**

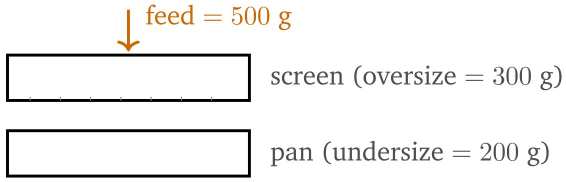
(A) 210 kJ

(B) 420 kJ

(C) 840 kJ

(D) 1680 kJ

Q44. A 500 g sample of cleaned grain is placed on the test screen shown; 300 g is retained on the screen as oversize while 200 g passes through into the pan as undersize. The fraction of the feed reporting as undersize (passing through the screen) is: **[2 marks]**



(A) 60%

(B) 40%

(C) 66.7%

(D) 150%

Q45. The thermal process in which a liquid food is heated to about 135–150°C for only a few seconds, then rapidly cooled and aseptically packed so that it keeps for months at room temperature, is called: **[2 marks]**

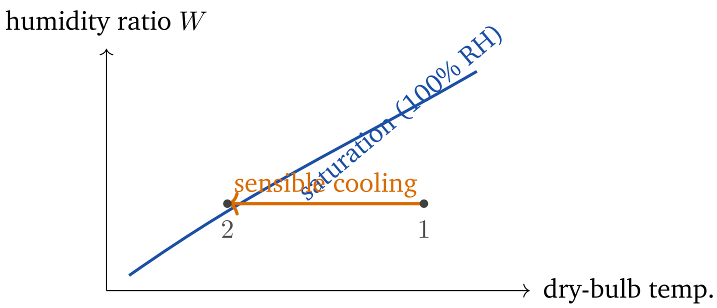
(A) LTLT (holder) pasteurization

(B) UHT (ultra-high-temperature) sterilization

(C) HTST pasteurization

(D) blanching

Q46. Moist air at a dry-bulb temperature of 35°C and 40% relative humidity is cooled by a sensible cooling process (no moisture added or removed), shown as the horizontal line 1–2 on the psychrometric sketch. During this process the relative humidity of the air: **[2 marks]**



(A) increases

(B) decreases

(C) remains constant

(D) first decreases and then increases

Detailed Solutions

Q1.

Solution

Concept – wheel slip of a traction wheel: Slip is the fractional loss of forward travel of a driving wheel: $s = \dfrac{V_t - V_a}{V_t} \times 100\%$, where V_t is the theoretical (no-slip) speed and V_a the actual speed.

Step 1 – list the data: $V_t = 6$ km/h, $V_a = 4.8$ km/h.

Step 2 – find the speed lost to slip: $V_t - V_a = 6 - 4.8 = 1.2$ km/h

Step 3 – divide by the theoretical speed: $s = \dfrac{1.2}{6}$

Step 4 – evaluate the ratio: $s = 0.20$

Step 5 – express as a percentage: $s = 20\%$

Final Answer: slip $= 20\% \Rightarrow \boxed{\text{B}}$

Answer: (B) Go Back to Q1

Q2.

Solution

Concept – speed ratio of a belt drive: For two pulleys connected by a belt with no slip, the surface speeds are equal, so $N_1 D_1 = N_2 D_2$.

Step 1 – list the data: Driver: $N_1 = 1000$ rpm, $D_1 = 150$ mm; driven: $D_2 = 300$ mm.

Step 2 – rearrange for the driven speed: $N_2 = \dfrac{N_1 D_1}{D_2}$

Step 3 – substitute the values: $N_2 = \dfrac{1000 \times 150}{300}$

Step 4 – multiply the numerator: $1000 \times 150 = 150000$

Step 5 – divide by 300**:** $N_2 = \dfrac{150000}{300} = 500$ rpm

Final Answer: $N_2 = 500$ rpm $\Rightarrow \boxed{\text{B}}$

Answer: (B) Go Back to Q2

Q3.

Solution

Concept – valve positions in the four-stroke cycle: The power (expansion) stroke follows compression and ignition. To keep the burning, high-pressure gas sealed in the cylinder so it can push the piston down, both valves must stay shut.

Step 1 – recall the stroke sequence: The four strokes are suction, compression, power (expansion) and exhaust.

Step 2 – reason about the power stroke: During the power stroke the burnt gas expands and drives the piston down; any open valve would let this pressure escape and destroy the work output.

Step 3 – state the valve positions: Therefore both the inlet valve and the exhaust valve remain closed throughout the power stroke.

Why the other options are wrong:

- B: both valves open only briefly near the end of exhaust / start of suction (valve overlap), not during power.
- C: the inlet valve opens during the suction stroke, not the power stroke.
- D: the exhaust valve opens during the exhaust stroke, not the power stroke.

Final Answer: both valves closed $\Rightarrow \boxed{\text{A}}$

Answer: (A) Go Back to Q3

Q4.

Solution

Concept – brake specific fuel consumption: BSFC is the mass of fuel burnt per unit of brake power per hour: BSFC $= \dfrac{\dot{m}_f}{P_b}$.

Step 1 – list the data: Fuel rate $\dot{m}_f = 8$ kg/h, brake power $P_b = 32$ kW.

Step 2 – write the ratio: BSFC $= \dfrac{8}{32}$

Step 3 – simplify the fraction: BSFC $= 0.25$

Step 4 – attach the units: BSFC $= 0.25$ kg/kWh

Final Answer: BSFC $= 0.25$ kg/kWh $\Rightarrow \boxed{\text{C}}$

Answer: (C) Go Back to Q4

Q5.

Solution

Concept – total width of cut of a multi-bottom plough: With the bottoms cutting side by side, the total width equals the number of bottoms times the width of each furrow slice: $W = n \times w$.

Step 1 – list the data: Number of bottoms $n = 3$, furrow width per bottom $w = 300$ mm $= 0.30$ m.

Step 2 – multiply: $W = 3 \times 0.30$

Step 3 – evaluate: $W = 0.90$ m

Final Answer: $W = 0.90 \text{ m} \Rightarrow \boxed{\text{A}}$

Answer: (A) Go Back to Q5

Q6.

Solution

Concept – classification of implements by hitching: Implements are trailed (pulled, full weight on their own wheels), semi-mounted (weight shared between tractor and a rear wheel) or mounted (fully carried by the three-point linkage).

Step 1 – read the key condition: The whole weight is on the tractor's three-point linkage and no weight rests on ground wheels.

Step 2 – match it to the category: An implement fully supported by the three-point hitch and lifted clear of the ground on the linkage is a mounted (integral) implement.

Why the other options are wrong:

- A: a trailed implement carries its own weight on its transport wheels.
- B: a semi-mounted implement puts part of its weight on a rear ground wheel.
- C: "ground-wheel implement" is not a standard hitch classification.

Final Answer: it is a mounted (integral) implement $\Rightarrow \boxed{\text{D}}$

Answer: (D) Go Back to Q6

Q7.

Solution

Concept – drawbar power is draft times speed: $P = F \times v$, with the draft F in newtons and the speed v in m/s.

Step 1 – list the data: $F = 8$ kN $= 8000$ N, $v = 3.6$ km/h.

Step 2 – convert the speed to m/s: $v = 3.6 \times \dfrac{1000}{3600}$

Step 3 – simplify the conversion: $v = \dfrac{3600}{3600} = 1.0$ m/s

Step 4 – apply the power formula: $P = 8000 \times 1.0$

Step 5 – evaluate: $P = 8000$ W

Step 6 – convert to kilowatts: $P = 8.0$ kW

Final Answer: $P = 8.0$ kW $\Rightarrow \boxed{\text{A}}$

Answer: (A) Go Back to Q7

Q8.

Solution

Concept – time to cover a field: The time required equals the area to be worked divided by the effective field capacity: $t = \dfrac{A}{\text{EFC}}$.

Step 1 – list the data: Area $A = 4$ ha, effective field capacity EFC $= 0.5$ ha/h.

Step 2 – write the formula: $t = \dfrac{A}{\text{EFC}}$

Step 3 – substitute: $t = \dfrac{4}{0.5}$

Step 4 – evaluate: $t = 8$ h

Final Answer: $t = 8$ h $\Rightarrow \boxed{\text{D}}$

Answer: (D) Go Back to Q8

Q9.

Solution

Concept – resolving an inclined pull: A pull P inclined at angle θ to the horizontal has a vertical component $V = P\sin\theta$ and a horizontal component $H = P\cos\theta$.

Step 1 – list the data: $P = 10$ kN, $\theta = 30^\circ$, with $\sin 30^\circ = 0.50$.

Step 2 – write the vertical component: $V = P\sin\theta$

Step 3 – substitute: $V = 10 \times 0.50$

Step 4 – evaluate: $V = 5.0$ kN

Final Answer: $V = 5.0$ kN $\Rightarrow \boxed{\text{B}}$

Answer: (B) Go Back to Q9

Q10.

Solution

Concept – spray application rate: Application rate (L/ha) $= \dfrac{\text{discharge (L/h)}}{\text{area covered (ha/h)}}$, where area covered $= \dfrac{W(\text{m}) \times S(\text{km/h})}{10}$.

Step 1 – list the data: Boom width $W = 10$ m, speed $S = 5$ km/h, discharge $= 25$ L/min.

Step 2 – find the area covered per hour: Area $= \dfrac{10 \times 5}{10} = 5$ ha/h

Step 3 – convert the discharge to per hour: 25 L/min $\times 60 = 1500$ L/h

Step 4 – divide discharge by area covered: Rate $= \dfrac{1500}{5}$

Step 5 – evaluate: Rate $= 300$ L/ha

Final Answer: application rate $= 300$ L/ha $\Rightarrow \boxed{\text{B}}$

Answer: (B) Go Back to Q10

Q11.

Solution

Concept – function of the straw walker: After the cylinder and concave thresh the crop, a mixture of grain and straw passes to the straw walkers, which shake and convey the straw rearward while loose grain drops through their openings.

Step 1 – identify the separating unit: The oscillating straw walkers separate the loose grain from the bulky straw by letting grain fall through while walking the straw out of the machine.

Step 2 – rule out the other parts: The cutter bar cuts the standing crop, the pick-up reel gathers and feeds the crop, and the grain tank merely stores the cleaned grain.

Final Answer: the straw walker separates grain from straw $\Rightarrow \boxed{\text{A}}$

Answer: (A) Go Back to Q11

Q12.

Solution

Concept – compression ratio of an engine: The compression ratio is the ratio of the maximum cylinder volume (piston at bottom dead centre) to the minimum (clearance) volume (piston at top dead centre): $r = \dfrac{V_{BDC}}{V_{clearance}}$.

Step 1 – match the definition: "Total cylinder volume at BDC divided by clearance volume at TDC" is exactly the definition of the compression ratio.

Why the other options are wrong:

- A: the cut-off ratio applies to the diesel cycle and compares volumes during constant-pressure heat addition.
- B: the expansion ratio compares volumes during the expansion stroke, not compression.
- D: the stroke-to-bore ratio compares two linear dimensions, not volumes.

Final Answer: this is the compression ratio $\Rightarrow \boxed{\text{C}}$

Answer: (C) Go Back to Q12

Q13.

Solution

Concept – pressure head of a fluid column: The pressure head is the height of water column equivalent to a gauge pressure: $h = \dfrac{p}{\gamma_w}$.

Step 1 – list the data: $p = 49.05$ kPa $= 49.05$ kN/m^2, $\gamma_w = 9.81$ kN/m^3.

Step 2 – write the formula: $h = \dfrac{p}{\gamma_w}$

Step 3 – substitute: $h = \dfrac{49.05}{9.81}$

Step 4 – evaluate: $h = 5.0$ m

Final Answer: $h = 5.0$ m $\Rightarrow \boxed{\text{A}}$

Answer: (A) Go Back to Q13

Q14.

Solution

Concept – continuity equation: For steady flow the mean velocity is the discharge divided by the cross-sectional area: $v = \dfrac{Q}{A}$.

Step 1 – list the data: $Q = 0.04\ \text{m}^3/\text{s},\ A = 0.02\ \text{m}^2$.

Step 2 – write the formula: $v = \dfrac{Q}{A}$

Step 3 – substitute: $v = \dfrac{0.04}{0.02}$

Step 4 – evaluate: $v = 2.0\ \text{m/s}$

Final Answer: $v = 2.0\ \text{m/s} \Rightarrow \boxed{\text{B}}$

Answer: (B) Go Back to Q14

Q15.

Solution

Concept – parts of a storm hydrograph: A single-peaked hydrograph rises along the rising limb to the peak, then falls along the recession limb back to base flow.

Step 1 – locate the marked part: Segment Y lies before the peak and climbs steeply as direct runoff builds up.

Step 2 – name that segment: The ascending part before the peak is the rising (concentration) limb.

Why the other options are wrong:

- B: the recession limb is the falling part after the peak, not before it.
- C: base flow is the low, steady groundwater contribution.
- D: the crest segment is the short region around the peak itself.

Final Answer: Y is the rising limb $\Rightarrow \boxed{\text{A}}$

Answer: (A) Go Back to Q15

Q16.

Solution

Concept – infiltration capacity: Infiltration capacity is the maximum rate (mm/h) at which a given soil, in its current condition, can take in water through its surface.

Step 1 – match the definition: "The maximum rate at which the soil can absorb water through its surface" is precisely the infiltration capacity.

Why the other options are wrong:

- A: percolation rate describes downward movement deeper in the profile, not the surface intake limit.
- B: the runoff coefficient is a dimensionless fraction, not an intake rate.
- C: saturated hydraulic conductivity is a soil property under saturated flow, distinct from the surface infiltration capacity.

Final Answer: this is the infiltration capacity $\Rightarrow \boxed{\text{D}}$

Answer: (D) Go Back to Q16

Q17.

Solution

Concept – topographic factor of the USLE: In $A = R\,K\,LS\,C\,P$, the term LS is the topographic factor; it combines the slope-length factor L and the slope-steepness factor S into a single multiplier.

Step 1 – identify LS: LS expresses how erosion increases with a longer and steeper slope, relative to a standard plot.

Step 2 – separate it from the others: R is rainfall erosivity, K is soil erodibility, C is the cover-management factor and P is the support-practice factor.

Final Answer: the slope length and steepness are the LS factor $\Rightarrow \boxed{\text{B}}$

Answer: (B) Go Back to Q17

Q18.

Solution

Concept – bench terracing: A bench terrace converts a continuous steep slope into a staircase of nearly level benches, cutting the effective slope length and gradient so that runoff velocity and soil erosion are reduced.

Step 1 – read the sketch: The hillside is shaped into level steps separated by short risers, which is the defining form of a bench terrace.

Why the other options are wrong:

- A: a graded bund is a small earthen embankment across the slope, not a series of level steps.
- B: a grassed waterway is a vegetated channel that safely conveys runoff.
- D: a check dam is a small barrier built across a gully or drainage line.

Final Answer: the structure is a bench terrace $\Rightarrow \boxed{\text{C}}$

Answer: (C) Go Back to Q18

Q19.

Solution

Concept – form factor of a watershed: The form factor is the ratio of the basin area to the square of the basin length: $F = \dfrac{A}{L^2}$.

Step 1 – list the data: $A = 24$ km^2, $L = 8$ km.

Step 2 – square the basin length: $L^2 = 8^2 = 64$ km^2

Step 3 – form the ratio: $F = \dfrac{24}{64}$

Step 4 – evaluate: $F = 0.375$

Final Answer: $F = 0.375 \Rightarrow \boxed{\text{B}}$

Answer: (B) Go Back to Q19

Q20.

Solution

Concept – trap efficiency of a reservoir: Trap efficiency is the fraction of the inflowing sediment load that settles out and is retained in the reservoir instead of escaping through the outlet.

Step 1 – match the definition: "Fraction of incoming sediment that is retained in the reservoir" is exactly the trap efficiency.

Why the other options are wrong:

- B: the sediment delivery ratio compares sediment delivered at a watershed outlet to the gross erosion within it.
- C: the runoff coefficient relates runoff to rainfall, not sediment.
- D: the erodibility index rates a soil's susceptibility to erosion.

Final Answer: this is the trap efficiency $\Rightarrow \boxed{\text{A}}$

Answer: (A) Go Back to Q20

Q21.

Solution

Concept – Universal Soil Loss Equation: $A = R\,K\,LS\,C\,P$, the product of the five erosion factors.

Step 1 – list the data: $R = 300$, $K = 0.25$, $LS = 2.0$, $C = 0.20$, $P = 1.0$.

Step 2 – multiply R and K: $300 \times 0.25 = 75$

Step 3 – multiply by LS: $75 \times 2.0 = 150$

Step 4 – multiply by C: $150 \times 0.20 = 30$

Step 5 – multiply by P: $30 \times 1.0 = 30$

Step 6 – state the result: $A = 30$ t/ha/yr

Final Answer: $A = 30$ t/ha/yr $\Rightarrow \boxed{\text{A}}$

Answer: (A) Go Back to Q21

Q22.

Solution

Concept – rational method for peak runoff: $Q = \dfrac{C\,i\,A}{360}$, with i in mm/h, A in ha and Q in m^3/s.

Step 1 – list the data: $C = 0.40$, $i = 5$ cm/h, $A = 90$ ha.

Step 2 – convert the intensity to mm/h: $i = 5$ cm/h $= 50$ mm/h

Step 3 – multiply C and i: $0.40 \times 50 = 20$

Step 4 – multiply by the area: $20 \times 90 = 1800$

Step 5 – divide by 360: $Q = \dfrac{1800}{360}$

Step 6 – evaluate: $Q = 5.0\ \text{m}^3/\text{s}$

Final Answer: $Q = 5.0\ \text{m}^3/\text{s} \Rightarrow \boxed{\text{C}}$

Answer: (C) Go Back to Q22

Q23.

Solution

Concept – runoff volume from a storm: Runoff depth $= C\times$ rainfall depth; runoff volume $=$ runoff depth $\times$ area.

Step 1 – list the data: Rainfall $P = 80$ mm, $C = 0.30$, area $= 25$ ha.

Step 2 – compute the runoff depth: $d = 0.30 \times 80 = 24$ mm

Step 3 – convert the runoff depth to metres: $d = 24$ mm $= 0.024$ m

Step 4 – convert the area to square metres: 25 ha $= 25 \times 10^4 = 250000$ m^2

Step 5 – multiply depth by area: $V = 0.024 \times 250000$

Step 6 – evaluate: $V = 6000$ m^3

Final Answer: $V = 6000\ \text{m}^3 \Rightarrow \boxed{\text{B}}$

Answer: (B) Go Back to Q23

Q24.

Solution

Concept – available water and readily available moisture: The total available water depth in the root zone is $d = \left(\dfrac{\theta_{fc} - \theta_{pwp}}{100}\right) \times \dfrac{\rho_b}{\rho_w} \times D$; the readily available moisture is the fraction of d allowed to deplete before irrigating.

Step 1 – list the data: $\theta_{fc} = 30\%$, $\theta_{pwp} = 15\%$, $\rho_b = 1.4$ g/cm^3, $\rho_w = 1.0$ g/cm^3, $D = 1.0$ m $= 1000$ mm, allowable depletion $= 40\%$.

Step 2 – find the moisture difference as a fraction: $\dfrac{30 - 15}{100} = 0.15$

Step 3 – multiply by the bulk-density ratio: $0.15 \times \dfrac{1.4}{1.0} = 0.15 \times 1.4 = 0.21$

Step 4 – multiply by the root-zone depth: $d = 0.21 \times 1000 = 210$ mm (total available water)

Step 5 – apply the 40% allowable depletion: RAM $= 0.40 \times 210$

Step 6 – evaluate: RAM $= 84$ mm

Final Answer: net depth applied $= 84$ mm $\Rightarrow \boxed{\text{B}}$

Answer: (B) Go Back to Q24

Q25.

Solution

Concept – relation between duty, delta and base period: $\Delta = \dfrac{8.64\,B}{D}$, with Δ the delta in metres, B the base period in days and D the duty in ha/cumec.

Step 1 – list the data: $B = 120$ days, $D = 864$ ha/cumec.

Step 2 – write the formula: $\Delta = \dfrac{8.64 \times B}{D}$

Step 3 – substitute: $\Delta = \dfrac{8.64 \times 120}{864}$

Step 4 – multiply the numerator: $8.64 \times 120 = 1036.8$

Step 5 – divide by the duty: $\Delta = \dfrac{1036.8}{864}$

Step 6 – evaluate: $\Delta = 1.2$ m

Final Answer: $\Delta = 1.2$ m $\Rightarrow \boxed{\text{C}}$

Answer: (C) Go Back to Q25

Q26.

Solution

Concept – water-application efficiency: Application efficiency is the depth of water actually stored in the root zone divided by the depth delivered to the field: $E_a = \dfrac{d_{stored}}{d_{delivered}}$.

Step 1 – list the data: Delivered $= 100$ mm, deep percolation loss $= 15$ mm, runoff loss $= 5$ mm.

Step 2 – find the depth stored in the root zone: $d_{stored} = 100 - 15 - 5$

Step 3 – evaluate the stored depth: $d_{stored} = 80$ mm

Step 4 – form the efficiency ratio: $E_a = \dfrac{80}{100}$

Step 5 – express as a percentage: $E_a = 0.80 = 80\%$

Final Answer: $E_a = 80\% \Rightarrow \boxed{\text{B}}$

Answer: (B) Go Back to Q26

Q27.

Solution

Concept – average infiltration rate: The average infiltration rate over a period is the cumulative infiltrated depth divided by the elapsed time: $\bar{f} = \dfrac{F}{t}$.

Step 1 – list the data: Cumulative infiltration $F = 60$ mm, time $t = 4$ h.

Step 2 – write the formula: $\bar{f} = \dfrac{F}{t}$

Step 3 – substitute: $\bar{f} = \dfrac{60}{4}$

Step 4 – evaluate: $\bar{f} = 15$ mm/h

Final Answer: $\bar{f} = 15$ mm/h $\Rightarrow \boxed{\text{D}}$

Answer: (D) Go Back to Q27

Q28.

Solution

Concept – water-storage efficiency: Storage efficiency is the depth of water actually stored in the root zone divided by the depth needed to refill the root zone: $E_s = \dfrac{d_{stored}}{d_{needed}}$.

Step 1 – list the data: Depth needed $= 60$ mm, depth actually stored $= 48$ mm.

Step 2 – write the ratio: $E_s = \dfrac{48}{60}$

Step 3 – simplify: $E_s = 0.80$

Step 4 – express as a percentage: $E_s = 80\%$

Final Answer: $E_s = 80\% \Rightarrow \boxed{\text{D}}$

Answer: (D) Go Back to Q28

Q29.

Solution

Concept – water (output) power of a pump: The power imparted to the water is $P = \rho_w\, g\, Q\, H$, with Q in m^3/s and H in m.

Step 1 – list the data: $Q = 50$ L/s $= 0.05$ m^3/s, $H = 12$ m, $\rho_w = 1000$ kg/m^3, $g = 9.81$ m/s^2.

Step 2 – multiply ρ_w and g: $1000 \times 9.81 = 9810$

Step 3 – multiply by the discharge: $9810 \times 0.05 = 490.5$

Step 4 – multiply by the head: $490.5 \times 12 = 5886$ W

Step 5 – convert to kilowatts: $P = 5.886$ kW ≈ 5.89 kW

Final Answer: $P \approx 5.89$ kW $\Rightarrow \boxed{\text{C}}$

Answer: (C) Go Back to Q29

Q30.

Solution

Concept – pump affinity law for head: At constant impeller diameter the head varies as the square of the speed: $\frac{H_2}{H_1} = \left(\frac{N_2}{N_1}\right)^2$.

Step 1 – list the data: $H_1 = 20$ m, $N_1 = 1450$ rpm, $N_2 = 2900$ rpm.

Step 2 – form the speed ratio: $\frac{N_2}{N_1} = \frac{2900}{1450} = 2$

Step 3 – square the speed ratio: $\left(\frac{N_2}{N_1}\right)^2 = 2^2 = 4$

Step 4 – multiply the original head by this factor: $H_2 = 20 \times 4$

Step 5 – evaluate: $H_2 = 80$ m

Final Answer: $H_2 = 80$ m $\Rightarrow \boxed{\text{D}}$

Answer: (D) Go Back to Q30

Q31.

Solution

Concept – transmissivity of a confined aquifer: Transmissivity is the product of the hydraulic conductivity and the saturated thickness: $T = K \times b$.

Step 1 – list the data: $K = 15$ m/day, $b = 20$ m.

Step 2 – write the formula: $T = K \times b$

Step 3 – substitute: $T = 15 \times 20$

Step 4 – evaluate: $T = 300$ m^2/day

Final Answer: $T = 300$ m^2/day $\Rightarrow \boxed{\text{A}}$

Answer: (A) Go Back to Q31

Q32.

Solution

Concept – design discharge from a drainage coefficient: The drainage coefficient is the depth of excess water to be removed per day; the discharge is that depth spread over the area, converted to per second.

Step 1 – list the data: Drainage coefficient $= 1.25$ cm/day $= 0.0125$ m/day, area $= 100$ ha.

Step 2 – convert the area to square metres: $100 \text{ ha} = 100 \times 10^4 = 10^6 \text{ m}^2$

Step 3 – find the daily volume to be drained: $V = 0.0125 \times 10^6 = 12500 \text{ m}^3/\text{day}$

Step 4 – convert one day to seconds: $1 \text{ day} = 86400 \text{ s}$

Step 5 – divide the volume by the seconds: $Q = \dfrac{12500}{86400}$

Step 6 – evaluate: $Q = 0.1447 \text{ m}^3/\text{s} \approx 0.145 \text{ m}^3/\text{s}$

Final Answer: $Q \approx 0.145 \text{ m}^3/\text{s} \Rightarrow \boxed{\text{D}}$

Answer: (D) Go Back to Q32

Q33.

Solution

Concept – overall irrigation efficiency: The overall efficiency is the product of the conveyance efficiency and the field-application efficiency: $E_o = E_c \times E_a$.

Step 1 – list the data: $E_c = 80\% = 0.80$, $E_a = 75\% = 0.75$.

Step 2 – write the formula: $E_o = E_c \times E_a$

Step 3 – substitute: $E_o = 0.80 \times 0.75$

Step 4 – multiply: $E_o = 0.60$

Step 5 – express as a percentage: $E_o = 60\%$

Final Answer: $E_o = 60\% \Rightarrow \boxed{\text{A}}$

Answer: (A) Go Back to Q33

Q34.

Solution

Concept – Darcy's law for aquifer discharge: The discharge through a saturated porous medium is $Q = K\,i\,A$, with K the hydraulic conductivity, i the hydraulic gradient and A the cross-sectional area.

Step 1 – list the data: $K = 20$ m/day, $i = 0.01$, $A = 50$ m^2.

Step 2 – write the formula: $Q = K\,i\,A$

Step 3 – multiply K and i: $20 \times 0.01 = 0.2$

Step 4 – multiply by the area: $Q = 0.2 \times 50$

Step 5 – evaluate: $Q = 10$ m^3/day

Final Answer: $Q = 10$ m^3/day $\Rightarrow \boxed{\text{A}}$

Answer: (A) Go Back to Q34

Q35.

Solution

Concept – moisture content on a wet basis: The wet-basis moisture content is the mass of water divided by the total (moist) mass of the sample: $M_{wb} = \dfrac{m_w}{m_{total}}$.

Step 1 – list the data: Moist mass = 250 g, bone-dry mass = 200 g.

Step 2 – find the mass of water: $m_w = 250 - 200 = 50$ g

Step 3 – divide by the total moist mass: $M_{wb} = \dfrac{50}{250}$

Step 4 – simplify: $M_{wb} = 0.20$

Step 5 – express as a percentage: $M_{wb} = 20\%$

Final Answer: $M_{wb} = 20\% \Rightarrow \boxed{\text{C}}$

Answer: (C) Go Back to Q35

Q36.

Solution

Concept – moisture content on a dry basis: The dry-basis moisture content is the mass of water divided by the mass of bone-dry matter: $M_{db} = \dfrac{m_w}{m_{dry}}$.

Step 1 – list the data: Water = 40 g, dry matter = 160 g.

Step 2 – write the ratio: $M_{db} = \dfrac{40}{160}$

Step 3 – simplify: $M_{db} = 0.25$

Step 4 – express as a percentage: $M_{db} = 25\%$

Final Answer: $M_{db} = 25\% \Rightarrow \boxed{\text{D}}$

Answer: (D) Go Back to Q36

Q37.

Solution

Concept – converting wet basis to dry basis: $M_{db} = \dfrac{M_{wb}}{1 - M_{wb}}$, with the moisture contents expressed as fractions.

Step 1 – list the data: $M_{wb} = 20\% = 0.20$.

Step 2 – form the denominator $1 - M_{wb}$**:** $1 - 0.20 = 0.80$

Step 3 – write the ratio: $M_{db} = \dfrac{0.20}{0.80}$

Step 4 – simplify: $M_{db} = 0.25$

Step 5 – express as a percentage: $M_{db} = 25\%$

Final Answer: $M_{db} = 25\% \Rightarrow \boxed{\text{C}}$

Answer: (C) Go Back to Q37

Q38.

Solution

Concept – critical moisture content: The critical moisture content marks the end of the constant-rate drying period; beyond it the surface can no longer be kept fully wet, so the drying rate falls in the falling-rate period.

Step 1 – match the definition: "The moisture content at which the drying rate first begins to fall below the constant value" is precisely the critical moisture content.

Why the other options are wrong:

- A: equilibrium moisture content is the final value reached in balance with the surrounding air.
- B: bound moisture is water held so tightly it exerts a lowered vapour pressure.
- C: free moisture is the moisture above the equilibrium value that is available for removal.

Final Answer: this is the critical moisture content $\Rightarrow \boxed{\text{D}}$

Answer: (D) Go Back to Q38

Q39.

Solution

Concept – Kick's law of size reduction: Kick's law states that the energy required per unit mass to reduce particle size is proportional to the logarithm of the size-reduction ratio: $E = K_K \ln\left(\frac{d_1}{d_2}\right)$.

Step 1 – recall the law: Kick assumed the energy depends only on the ratio of the feed size d_1 to the product size d_2, through the term $\ln(d_1/d_2)$.

Why the other options are wrong:

- A: energy proportional to the new surface area created is Rittinger's law, not Kick's.
- B: proportionality to the square of the particle size is not any of the standard comminution laws.
- C: proportionality to $\left(\frac{1}{d_2} - \frac{1}{d_1}\right)$, i.e. to new surface, is again Rittinger's law.

Final Answer: energy $\propto \ln(d_1/d_2) \Rightarrow \boxed{\text{D}}$

Answer: (D) Go Back to Q39

Q40.

Solution

Concept – indented cylinder separator: The small indents (pockets) on the rotating cylinder wall lift only the short particles as the cylinder turns and drop them into a trough, while the longer particles remain in the cylinder. Separation is therefore by length.

Step 1 – see how the pockets act: Each indent can cradle a short grain but cannot hold a long one, so only short grains are carried up and thrown into the collecting trough.

Step 2 – identify the property exploited: Because the distinction between lifted and unlifted grains is their length relative to the pocket size, the machine grades seeds by length.

Why the other options are wrong:

- A: colour separation is done by optical (electronic colour) sorters.
- B: density separation is done by specific-gravity separators.
- D: surface texture is used in roll or belt separators, not the indented cylinder.

Final Answer: it separates seeds by length $\Rightarrow \boxed{\text{C}}$

Answer: (C) Go Back to Q40

Q41.

Solution

Concept – capacity of a bucket elevator: The handling rate is the mass of grain per bucket times the number of buckets discharging per unit time.

Step 1 – list the data: Grain per bucket = 2 kg, buckets per minute = 30.

Step 2 – find the mass rate per minute: $\dot{m} = 2 \times 30 = 60$ kg/min

Step 3 – convert to kg per hour: $\dot{m} = 60 \times 60 = 3600$ kg/h

Step 4 – convert to tonnes per hour: $\dot{m} = \dfrac{3600}{1000} = 3.6$ t/h

Final Answer: capacity = 3.6 t/h $\Rightarrow \boxed{\text{D}}$

Answer: (D) Go Back to Q41

Q42.

Solution

Concept – Fourier's law of steady conduction: $Q = \dfrac{k\,A\,\Delta T}{L}$, with k the conductivity, A the area, ΔT the temperature difference and L the thickness.

Step 1 – list the data: $k = 0.2\,\text{W/m·K}$, $A = 3\,\text{m}^2$, $L = 0.05\,\text{m}$, $\Delta T = 80–30 = 50\,\text{K}$.

Step 2 – form the numerator $kA\Delta T$: $kA\Delta T = 0.2 \times 3 \times 50$

Step 3 – multiply step by step: $0.2 \times 3 = 0.6$

$0.6 \times 50 = 30$

Step 4 – divide by the thickness: $Q = \dfrac{30}{0.05}$

Step 5 – evaluate: $Q = 600$ W

Final Answer: $Q = 600$ W $\Rightarrow \boxed{\text{C}}$

Answer: (C) Go Back to Q42

Q43.

Solution

Concept – sensible heat to raise temperature: $Q = m\,c\,\Delta T$, with m the mass, c the specific heat and ΔT the temperature rise.

Step 1 – list the data: $m = 5$ kg, $c = 4.2$ kJ/kg $\cdot$ K, $\Delta T = 60 - 20 = 40$ K.

Step 2 – write the formula: $Q = m\,c\,\Delta T$

Step 3 – substitute: $Q = 5 \times 4.2 \times 40$

Step 4 – multiply step by step: $5 \times 4.2 = 21$

$21 \times 40 = 840$

Step 5 – state the result: $Q = 840$ kJ

Final Answer: $Q = 840$ kJ $\Rightarrow \boxed{\text{C}}$

Answer: (C) Go Back to Q43

Q44.

Solution

Concept – undersize fraction on a screen: The undersize fraction is the mass that passes through the screen divided by the mass of feed placed on it.

Step 1 – list the data: Feed $= 500$ g, undersize passing through $= 200$ g.

Step 2 – form the ratio: Fraction $= \dfrac{200}{500}$

Step 3 – simplify: Fraction $= 0.40$

Step 4 – express as a percentage: Fraction $= 40\%$

Final Answer: undersize fraction $= 40\% \Rightarrow \boxed{\text{B}}$

Answer: (B) Go Back to Q44

Q45.

Solution

Concept – ultra-high-temperature (UHT) processing: UHT heats a liquid food to about 135–150°C for a few seconds, achieving commercial sterility; combined with aseptic packaging it gives a long shelf life at room temperature.

Step 1 – match the time–temperature to the process: A very high temperature (135–150°C) held for only a few seconds, then rapidly cooled and aseptically packed, is the UHT sterilization process.

Why the other options are wrong:

- A: LTLT (holder) pasteurization uses about 63°C for 30 minutes.
- C: HTST pasteurization uses about 72°C for 15 seconds and needs refrigeration afterwards.
- D: blanching is a mild heat treatment of vegetables to inactivate enzymes, not a sterilization.

Final Answer: this is UHT sterilization $\Rightarrow \boxed{\text{B}}$

Answer: (B) Go Back to Q45

Q46.

Solution

Concept – sensible cooling on the psychrometric chart: In sensible cooling no moisture is added or removed, so the humidity ratio W stays constant while the dry-bulb temperature falls (a horizontal line to the left).

Step 1 – track the humidity ratio: W is unchanged, so the actual amount of water vapour per kg of dry air is the same at states 1 and 2.

Step 2 – track the saturation capacity: As the temperature falls, the saturation vapour pressure of the air decreases, so the air can now hold much less moisture than before.

Step 3 – combine the two effects: Relative humidity is the ratio of the actual vapour present to the saturation amount. With the numerator fixed and the denominator shrinking, this ratio rises.

Step 4 – state the conclusion: Therefore the relative humidity increases during sensible cooling (approaching saturation).

Why the other options are wrong:

- B: RH would fall on heating, not cooling.
- C: RH is not constant, because the saturation capacity changes with temperature even though W does not.
- D: there is no reversal; the trend is monotonic for pure sensible cooling until saturation is reached.

Final Answer: the relative humidity increases $\Rightarrow \boxed{\text{A}}$

Answer: (A) Go Back to Q46

Answer Key

Q	Ans	Q	Ans	Q	Ans	Q	Ans	Q	Ans
1	B	2	B	3	A	4	C	5	A
6	D	7	A	8	D	9	B	10	B
11	A	12	C	13	A	14	B	15	A
16	D	17	B	18	C	19	B	20	A
21	A	22	C	23	B	24	B	25	C
26	B	27	D	28	D	29	C	30	D
31	A	32	D	33	A	34	A	35	C
36	D	37	C	38	D	39	D	40	C
41	D	42	C	43	C	44	B	45	B
46	A								