GATE Agricultural Engineering

Sample Paper – 8

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 driving wheel of a tractor covers 50 m in 10 revolutions when running without any load, but covers only 45 m in the same 10 revolutions when pulling a loaded implement. The wheel slip is: **[1 mark]**

(A) 5%

(B) 90%

(C) 11.1%

(D) 10%

Q2. A diesel engine consumes 5.4 kg of fuel per hour while developing a brake power of 20 kW. The brake specific fuel consumption (BSFC) of the engine is: **[1 mark]**

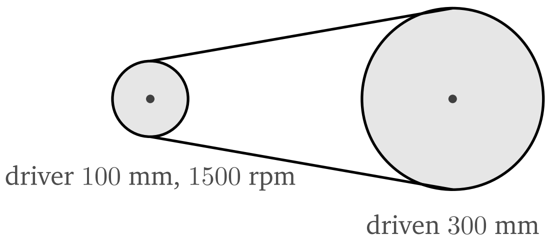
(A) 0.108 kg/kWh

(B) 0.27 kg/kWh

(C) 3.70 kg/kWh

(D) 0.54 kg/kWh

Q3. A driver pulley of diameter 100 mm rotates at 1500 rpm and drives, through a belt, a driven pulley of diameter 300 mm, as shown. Neglecting belt slip, the speed of the driven pulley is: **[1 mark]**



(A) 500 rpm

(B) 4500 rpm

(C) 1500 rpm

(D) 150 rpm

Q4. In the fuel-injection system of a compression-ignition (diesel) tractor engine, the component that meters the exact quantity of fuel and delivers it at high pressure to the injector is the: **[1 mark]**

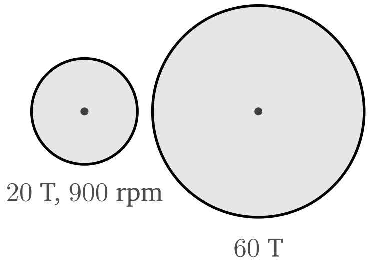
(A) carburettor

(B) governor

(C) fuel injection pump

(D) air cleaner

Q5. A spur gear with 20 teeth (the driver) rotates at 900 rpm and meshes with a gear having 60 teeth, as shown. The speed of the 60-tooth gear is: **[1 mark]**



(A) 2700 rpm
(B) 900 rpm
(C) 100 rpm
(D) 300 rpm

Q6. The device fitted to a tractor engine to keep the engine speed nearly constant in spite of variations in load by automatically adjusting the fuel supply is the: **[1 mark]**

(A) clutch
(B) carburettor
(C) magneto
(D) governor

Q7. A tractor delivers a drawbar power of 15 kW while the power available at its driving axle is 20 kW. The tractive efficiency of the tractor is: **[1 mark]**

(A) 75%
(B) 133%
(C) 35%
(D) 5%

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

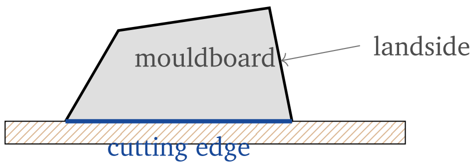
(A) 2 h

(B) 8 h

(C) 0.125 h

(D) 4 h

Q9. The sketch shows the bottom of a mouldboard plough. The part marked at the lower cutting edge, which penetrates the soil and cuts the furrow slice horizontally, is the: **[1 mark]**



(A) mouldboard

(B) landside

(C) share

(D) frog

Q10. During calibration a seed drill is found to drop 12.5 kg of seed while covering an area of 0.1 ha. The seed rate of the drill is: **[1 mark]**

(A) 1.25 kg/ha

(B) 100 kg/ha

(C) 125 kg/ha

(D) 250 kg/ha

Q11. In a hydraulic (liquid) crop-protection sprayer, the component that breaks the liquid stream into fine droplets and distributes them over the crop is the: **[1 mark]**

(A) pump

(B) pressure gauge

(C) strainer

(D) nozzle

Q12. A tractor engine develops 30 kW at the flywheel. If 20% of this power is lost in the transmission and in rolling resistance, the power available at the drawbar is: **[1 mark]**

(A) 30 kW

(B) 24 kW

(C) 6 kW

(D) 37.5 kW

Soil & Water Conservation Engineering

Q13. The ground surface of a field falls by 3 m over a horizontal distance of 60 m. The land slope, expressed as a percentage, is: **[1 mark]**

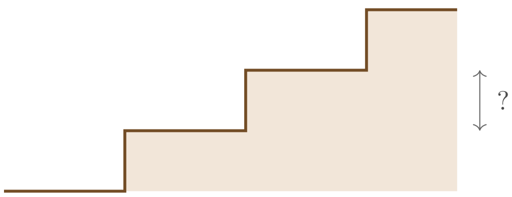
(A) 20%

(B) 5%

(C) 0.05%

(D) 2%

Q14. The figure shows a bench-terraced hillslope. The vertical drop from the surface of one terrace to the surface of the next terrace below it (marked in the figure) is known as the: **[1 mark]**



(A) vertical interval

(B) horizontal interval

(C) terrace grade

(D) freeboard

Q15. A small temporary structure built across the bed of an active gully to reduce the flow velocity and to trap the sediment carried by the runoff is called a: **[1 mark]**

(A) chute spillway

(B) drop-inlet spillway

(C) contour bund

(D) check dam

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

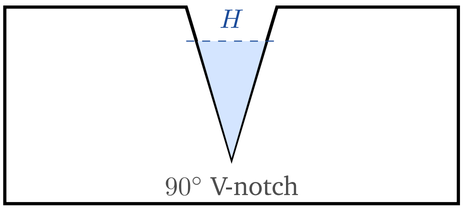
(A) infiltration capacity

(B) percolation rate

(C) permeability

(D) porosity

Q17. Discharge over the sharp-crested 90° triangular (V-notch) weir shown is measured by the head H over the vertex. For such a V-notch weir the discharge Q varies with the head H as: **[1 mark]**



(A) $Q \propto H^{1/2}$

(B) $Q \propto H^{3/2}$

(C) $Q \propto H^{5/2}$

(D) $Q \propto H^{2}$

Q18. The soil-conservation practice of growing erosion-permitting crops (like row crops) and erosion-resisting crops (like close-growing grasses or legumes) in alternate bands laid out across the slope or across the prevailing wind is called: [1 mark]

(A) mulching

(B) contour bunding

(C) terracing

(D) strip cropping

Q19. A hydraulic structure is designed for a flood having a return period (recurrence interval) of 25 years. The probability that this flood is equalled or exceeded in any one year is: [1 mark]

(A) 25%

(B) 2.5%

(C) 4%

(D) 0.4%

Q20. The detachment of individual soil particles from the soil mass by the direct impact of falling raindrops, which is the very first stage of the water-erosion process, is called: [1 mark]

(A) rill erosion

(B) gully erosion

(C) sheet erosion

(D) splash (raindrop) erosion

Soil & Water Conservation Engineering (continued)

Q21. The gross soil erosion produced within a watershed during a year is 1000 tonnes, and the sediment delivery ratio of the watershed is 0.30. The sediment yield (sediment actually delivered at the outlet) is: [2 marks]

(A) 700 t

(B) 300 t

(C) 3333 t

(D) 1000 t

Q22. A catchment of area 100 ha has a runoff coefficient of 0.50. For a design rainfall intensity of 72 mm/h, the peak runoff estimated by the rational method $(Q = CiA/360,\ i$ in mm/h, A in ha$)$ is: **[2 marks]**

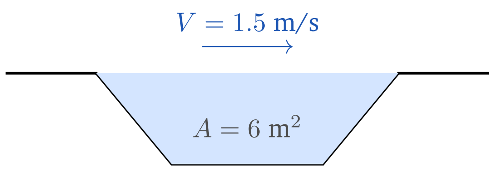
(A) 10.0 m^3/s

(B) 5.0 m^3/s

(C) 20.0 m^3/s

(D) 2.5 m^3/s

Q23. Water flows in the trapezoidal grassed waterway shown with a flow cross-sectional area of 6 m^2 and a mean velocity of 1.5 m/s. The discharge carried by the waterway is: **[2 marks]**



(A) 4.0 m^3/s

(B) 7.5 m^3/s

(C) 9.0 m^3/s

(D) 0.25 m^3/s

Irrigation & Drainage Engineering

Q24. The total available water held in a crop root zone is 200 mm. Irrigation is scheduled when 50% of this available water has been depleted (a management-allowed depletion of 50%). The net depth of water to be applied at each irrigation is: **[2 marks]**

(A) 200 mm

(B) 400 mm

(C) 50 mm

(D) 100 mm

Q25. An irrigation canal supplies water with a duty of 864 ha/cumec for a crop whose base period is 100 days. The delta (total depth of water) supplied to the crop is: **[2 marks]**

(A) 8.64 cm

(B) 86.4 cm

(C) 100 cm

(D) 10 cm

Q26. A crop requires a net irrigation depth of 60 mm at each watering, and its peak-period consumptive use (evapotranspiration) is 5 mm/day. The interval (frequency) between two successive irrigations during the peak period is: **[2 marks]**

(A) 300 days

(B) 5 days

(C) 6 days

(D) 12 days

Q27. A pump lifts 50 L/s of water against a total head of 10 m. The water (hydraulic) power imparted to the water, i.e. the output power, is nearest to (take $\rho_w = 1000$ kg/m^3, $g = 9.81$ m/s^2): **[2 marks]**

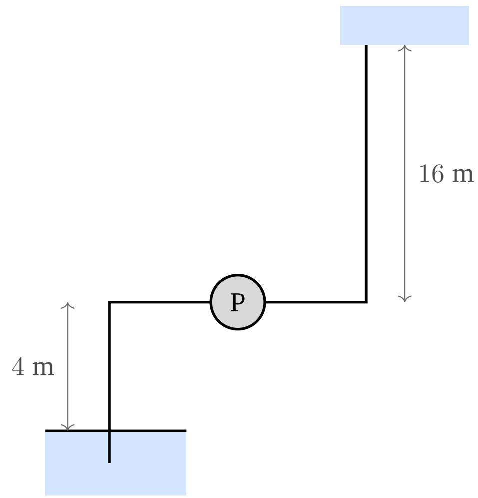
(A) 4.9 kW

(B) 9.81 kW

(C) 2.45 kW

(D) 49.0 kW

Q28. In the pumping installation shown, water is lifted from a sump through a static suction lift of 4 m and delivered to a tank through a static delivery lift of 16 m. Neglecting friction losses, the total static head against which the pump works is: **[2 marks]**



(A) 20 m

(B) 12 m

(C) 64 m

(D) 4 m

Q29. Groundwater flows through a confined aquifer of hydraulic conductivity 20 m/day under a hydraulic gradient of 0.01. The flow cross-sectional area normal to the flow is 50 m^2. The volumetric flow rate through the aquifer, by Darcy's law, is: **[2 marks]**

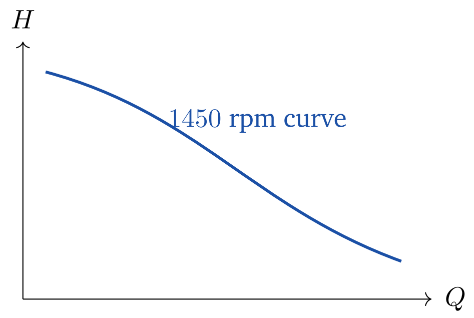
(A) 5 m^3/day

(B) 10 m^3/day

(C) 1000 m^3/day

(D) 0.2 m^3/day

Q30. A centrifugal pump develops a head of 16 m when running at 1450 rpm, with the characteristic curve shown. Using the pump affinity laws, the head developed when the speed is raised to 2900 rpm (discharge changing accordingly) is: **[2 marks]**



(A) 32 m

(B) 64 m

(C) 16 m

(D) 128 m

Q31. A subsurface drainage system is designed for a drainage coefficient of 1.2 cm/day over an agricultural area of 100 ha. The design discharge capacity of the system is nearest to: **[2 marks]**

(A) 0.139 m^3/s

(B) 1.39 m^3/s

(C) 0.0139 m^3/s

(D) 0.278 m^3/s

Q32. A rotating sprinkler discharges 0.5 L/s of water and wets a square area defined by a sprinkler spacing of 10 m $\times$ 10 m. The application rate (depth of water applied per unit time) of the sprinkler is: **[2 marks]**

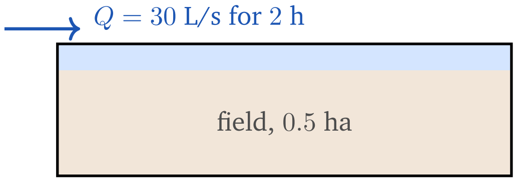
(A) 5 mm/h

(B) 18 mm/h

(C) 50 mm/h

(D) 36 mm/h

Q33. A stream of 30 L/s is diverted onto the border-irrigated field of area 0.5 ha shown and is allowed to run for 2 hours. Assuming all the water is stored in the field, the average depth of water applied is: **[2 marks]**



(A) 21.6 mm

(B) 86.4 mm

(C) 43.2 mm

(D) 4.32 mm

Q34. Irrigation water of electrical conductivity 2 dS/m is applied to a field, and the salt tolerance of the crop allows a drainage-water electrical conductivity of 10 dS/m. The leaching requirement (fraction of applied water that must pass below the root zone) is: **[2 marks]**

(A) 5.0

(B) 0.2

(C) 0.5

(D) 2.0

Agricultural Processing & Food Engineering

Q35. A batch of 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) 25%

(B) 16.67%

(C) 20%

(D) 80%

Q36. A dryer receives 100 kg of paddy at 24% moisture content (wet basis) and dries it down to 12% moisture content (wet basis). The mass of water removed during drying is nearest to: **[2 marks]**

(A) 12.0 kg

(B) 24.0 kg

(C) 6.8 kg

(D) 13.6 kg

Q37. A sample of cleaned wheat has a bulk density of 1200 kg/m^3 and a true (particle) density of 1500 kg/m^3. The porosity of the grain bed is: **[2 marks]**

(A) 80%

(B) 25%

(C) 20%

(D) 125%

Q38. The law of size reduction which states that the energy required to reduce a material is proportional to the logarithm of the ratio of the feed size to the product size (i.e. proportional to the size-reduction ratio) is: **[2 marks]**

(A) Kick's law

(B) Rittinger's law

(C) Bond's law

(D) Stokes' law

Q39. In a grain dryer, 10 kg of water is to be evaporated from the grain. Taking the latent heat of vaporisation of water as 2260 kJ/kg, the heat energy required just to evaporate this water is: **[2 marks]**

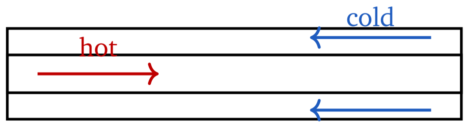
(A) 22.6 MJ

(B) 226 MJ

(C) 2.26 MJ

(D) 226 kJ

Q40. The double-pipe heat exchanger shown carries the hot fluid in the inner pipe and the cold fluid in the annulus, and the two fluids flow in opposite directions. For given inlet and outlet temperatures, this flow arrangement is called and gives: **[2 marks]**



(A) parallel flow, with a smaller mean temperature difference

(B) counter flow, with a larger log-mean temperature difference

(C) cross flow, with zero temperature difference

(D) mixed flow, with equal inlet temperatures

Q41. A food product weighing 200 kg is to be cooled from $30°$C to $5°$C in a cold store. Taking the specific heat of the product as 3.6 kJ/kg · K (above freezing), the sensible heat to be removed is: **[2 marks]**

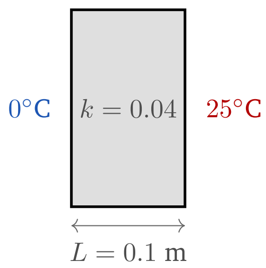
(A) 9 MJ

(B) 18 MJ

(C) 36 MJ

(D) 3.6 MJ

Q42. The insulated wall of a cold store, shown in cross-section, is 0.1 m thick with a thermal conductivity of 0.04 W/m · K and a face area of 10 m^2. Its inner and outer faces are at $0°$C and $25°$C. The steady rate of heat conduction (heat leak) through the wall is: **[2 marks]**



(A) 100 W

(B) 200 W

(C) 50 W

(D) 400 W

Q43. At a given temperature, the actual partial pressure of water vapour in a mass of moist air is 2.0 kPa, while the saturation vapour pressure of water at that temperature is 5.0 kPa. The relative humidity of the air is: **[2 marks]**

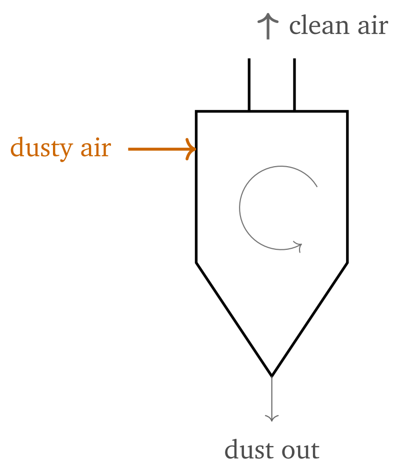
(A) 20%

(B) 250%

(C) 40%

(D) 2.5%

Q44. In the cyclone separator shown, dust-laden air enters tangentially and spirals down the conical body; the heavier particles are thrown to the wall and collected at the bottom while clean air leaves from the top. The principle used to separate the particles is: **[2 marks]**



(A) gravity settling alone

(B) magnetic attraction

(C) centrifugal force

(D) electrostatic attraction

Q45. The unit operation in which a liquid or slurry food (such as milk or coffee extract) is atomised into fine droplets and contacted with a stream of hot air so that it is converted almost instantly into a dry powder is: **[2 marks]**

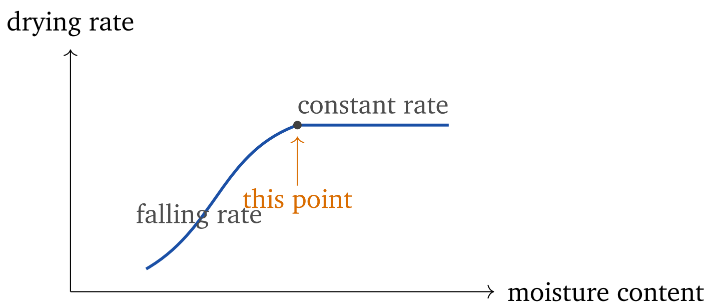
(A) freeze drying

(B) spray drying

(C) drum drying

(D) tray drying

Q46. The drying-rate curve of a moist food, plotted as drying rate against moisture content, is shown. The moisture content marked at the point where the constant-rate period ends and the falling-rate period begins is called the: **[2 marks]**



(A) equilibrium moisture content

(B) bound moisture content

(C) free moisture content

(D) critical moisture content

Detailed Solutions

Q1.

Solution

Concept – wheel slip: Slip is the loss of travel of a driving wheel under load compared with its travel with no load, for the same number of revolutions: slip $= \frac{S_0 - S_L}{S_0} \times 100$, where S_0 is the no-load travel and S_L the loaded travel.

Step 1 – list the data: $S_0 = 50$ m (no load), $S_L = 45$ m (loaded), both in 10 revolutions.

Step 2 – find the loss of travel: $S_0 - S_L = 50 - 45$

$S_0 - S_L = 5$ m

Step 3 – divide by the no-load travel: $\frac{5}{50} = 0.10$

Step 4 – convert to a percentage: slip $= 0.10 \times 100 = 10\%$

Final Answer: slip $= 10\% \Rightarrow \boxed{\text{D}}$

Answer: (D) Go Back to Q1

Q2.

Solution

Concept – brake specific fuel consumption: BSFC is the mass of fuel consumed per unit brake power per unit time: BSFC $= \frac{\dot{m}_f}{\text{BP}}$.

Step 1 – list the data: $\dot{m}_f = 5.4$ kg/h, BP $= 20$ kW.

Step 2 – write the formula: BSFC $= \frac{5.4}{20}$

Step 3 – carry out the division: $\frac{5.4}{20} = 0.27$

Step 4 – attach the units: BSFC $= 0.27$ kg/kWh

Final Answer: BSFC $= 0.27$ kg/kWh $\Rightarrow \boxed{\text{B}}$

Answer: (B) Go Back to Q2

Q3.

Solution

Concept – belt drive speed ratio: For a belt drive without slip the product of speed and diameter is the same on both pulleys: $N_1 D_1 = N_2 D_2$.

Step 1 – list the data: $N_1 = 1500$ rpm, $D_1 = 100$ mm, $D_2 = 300$ mm.

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

Step 3 – substitute the values: $N_2 = 1500 \times \dfrac{100}{300}$

Step 4 – simplify the diameter ratio: $\dfrac{100}{300} = \dfrac{1}{3}$

Step 5 – evaluate: $N_2 = 1500 \times \dfrac{1}{3} = 500 \text{ rpm}$

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

Answer: (A) Go Back to Q3

Q4.

Solution

Concept – fuel-injection system of a diesel engine: In a compression-ignition engine there is no carburettor; the fuel is metered and pressurised separately before injection.

Step 1 – identify the metering-and-pressure element: The fuel injection pump receives low-pressure fuel, measures the exact quantity for each cycle and raises it to a high pressure.

Step 2 – follow the fuel to the cylinder: This high-pressure fuel is then sent to the injector (atomiser), which sprays it into the combustion chamber.

Why the other options are wrong:

- A: a carburettor is used in spark-ignition (petrol) engines, not in diesel engines.
- B: the governor only controls speed by limiting the fuel quantity; it does not pressurise the fuel.
- D: the air cleaner filters intake air and has nothing to do with fuel metering.

Final Answer: the fuel injection pump meters and pressurises the fuel $\Rightarrow \boxed{\text{C}}$

Answer: (C) Go Back to Q4

Q5.

Solution

Concept – gear speed ratio: For a pair of meshing gears the product of speed and number of teeth is the same: $N_1T_1 = N_2T_2$.

Step 1 – list the data: $N_1 = 900$ rpm, $T_1 = 20$, $T_2 = 60$.

Step 2 – solve for the driven speed: $N_2 = N_1 \times \dfrac{T_1}{T_2}$

Step 3 – substitute the values: $N_2 = 900 \times \dfrac{20}{60}$

Step 4 – simplify the tooth ratio: $\dfrac{20}{60} = \dfrac{1}{3}$

Step 5 – evaluate: $N_2 = 900 \times \dfrac{1}{3} = 300$ rpm

Final Answer: $N_2 = 300$ rpm $\Rightarrow \boxed{\text{D}}$

Answer: (D) Go Back to Q5

Q6.

Solution

Concept – speed control of an engine: When the load on an engine changes, its speed tends to change; a control device restores the set speed by adjusting the fuel supply.

Step 1 – identify the speed-regulating device: The governor senses the change in engine speed and increases or decreases the fuel delivered so that the speed stays nearly constant.

Why the other options are wrong:

- A: the clutch only engages or disengages the drive; it does not regulate speed.
- B: a carburettor mixes air and fuel in petrol engines; it is not the speed regulator.
- C: a magneto generates the ignition spark; it has no role in speed control.

Final Answer: the governor keeps the engine speed constant $\Rightarrow \boxed{\text{D}}$

Answer: (D) Go Back to Q6

Q7.

Solution

Concept – tractive efficiency: Tractive efficiency is the ratio of the drawbar power (useful output) to the axle power (power reaching the driving wheels): $\eta_t = \dfrac{\text{drawbar power}}{\text{axle power}}$.

Step 1 – list the data: Drawbar power $= 15$ kW, axle power $= 20$ kW.

Step 2 – form the ratio: $\eta_t = \dfrac{15}{20}$

Step 3 – simplify: $\eta_t = 0.75$

Step 4 – express as a percentage: $\eta_t = 0.75 \times 100 = 75\%$

Final Answer: $\eta_t = 75\% \Rightarrow \boxed{\text{A}}$

Answer: (A) Go Back to Q7

Q8.

Solution

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

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

Step 2 – write the formula: $t = \dfrac{4}{0.5}$

Step 3 – carry out the division: $\dfrac{4}{0.5} = 8$

Step 4 – attach the unit: $t = 8$ h

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

Answer: (B) Go Back to Q8

Q9.

Solution

Concept – parts of a mouldboard plough bottom: The plough bottom is made of the share, the mouldboard and the landside mounted on the frog. Each has a distinct job.

Step 1 – identify the lower cutting edge: The share is the sharp, wedge-shaped part at the bottom that first enters the soil and cuts the furrow slice horizontally.

Step 2 – separate it from the neighbours: The mouldboard then lifts, turns and inverts the slice cut by the share.

Why the other options are wrong:

- A: the mouldboard turns the slice; it does not do the horizontal cutting.
- B: the landside presses against the furrow wall to take the side thrust; it does not cut the slice.
- D: the frog is only the base to which the share, mouldboard and landside are bolted.

Final Answer: the share cuts the furrow slice $\Rightarrow \boxed{\text{C}}$

Answer: (C) Go Back to Q9

Q10.

Solution

Concept – seed rate from calibration: Seed rate is the mass of seed dropped per unit area: seed rate $= \dfrac{\text{mass of seed}}{\text{area covered}}$.

Step 1 – list the data: Mass of seed $= 12.5$ kg, area covered $= 0.1$ ha.

Step 2 – write the formula: seed rate $= \dfrac{12.5}{0.1}$

Step 3 – carry out the division: $\dfrac{12.5}{0.1} = 125$

Step 4 – attach the units: seed rate $= 125$ kg/ha

Final Answer: seed rate $= 125$ kg/ha $\Rightarrow \boxed{\text{C}}$

Answer: (C) Go Back to Q10

Q11.

Solution

Concept – components of a hydraulic sprayer: A sprayer draws liquid with a pump, filters it, regulates the pressure and finally atomises it for application.

Step 1 – identify the atomising element: The nozzle is the part where the pressurised liquid is forced through a small orifice and breaks up into fine droplets that are spread over the crop.

Why the other options are wrong:

- A: the pump only supplies pressure to the liquid; it does not form droplets.
- B: the pressure gauge only indicates the operating pressure.
- C: the strainer only removes solid particles to protect the nozzle from clogging.

Final Answer: the nozzle atomises the liquid $\Rightarrow \boxed{\text{D}}$

Answer: (D) Go Back to Q11

Q12.

Solution

Concept – power available at the drawbar: The drawbar power is the flywheel power reduced by the fraction lost in the transmission and in rolling: DBP $=$ flywheel power $\times$ $(1 -$ fractional loss$)$.

Step 1 – list the data: Flywheel power $= 30$ kW, fractional loss $= 20\% = 0.20$.

Step 2 – find the surviving fraction: $1 - 0.20 = 0.80$

Step 3 – apply it to the flywheel power: DBP $= 30 \times 0.80$

Step 4 – evaluate: DBP $= 24$ kW

Final Answer: DBP $= 24$ kW $\Rightarrow \boxed{\text{B}}$

Answer: (B) Go Back to Q12

Q13.

Solution

Concept – land slope as a percentage: The percentage land slope is the vertical fall divided by the horizontal distance, times 100: $S = \dfrac{\text{vertical fall}}{\text{horizontal distance}} \times 100$.

Step 1 – list the data: Vertical fall $= 3$ m, horizontal distance $= 60$ m.

Step 2 – form the ratio: $\dfrac{3}{60} = 0.05$

Step 3 – convert to a percentage: $S = 0.05 \times 100 = 5\%$

Final Answer: $S = 5\% \Rightarrow \boxed{\text{B}}$

Answer: (B) Go Back to Q13

Q14.

Solution

Concept – geometry of bench terraces: Bench terraces convert a slope into a series of level steps. Two spacings describe them: a vertical one and a horizontal one.

Step 1 – read the marked distance: The arrow in the figure measures the vertical drop from the surface of one terrace to the surface of the next terrace below.

Step 2 – name that distance: This vertical drop between successive terraces is the vertical interval (V.I.).

Why the other options are wrong:

- B: the horizontal interval is the horizontal spacing between terraces, not the vertical drop.
- C: the terrace grade is the longitudinal slope along a graded terrace channel.
- D: freeboard is the extra height of a channel or bund above the design water level.

Final Answer: the marked distance is the vertical interval $\Rightarrow \boxed{A}$

Answer: (A) Go Back to Q14

Q15.

Solution

Concept – gully-control structures: Gully erosion is controlled by small structures placed across the gully bed to slow the flow and hold back sediment.

Step 1 – identify the sediment-trapping structure: A check dam is a low temporary barrier built across a gully; it reduces the flow velocity so that the sediment carried by the runoff settles behind it.

Why the other options are wrong:

- A: a chute spillway safely conducts water down a steep drop; it does not trap sediment.
- B: a drop-inlet spillway carries water from a higher to a lower level through a vertical inlet.
- C: a contour bund is built along the contour on cultivated land, not across a gully bed.

Final Answer: the structure is a check dam $\Rightarrow \boxed{D}$

Answer: (D) Go Back to Q15

Q16.

Solution

Concept – infiltration capacity: Infiltration is the entry of water into the soil through its surface. The upper limit of this rate for a given soil condition has a specific name.

Step 1 – define the maximum rate: The infiltration capacity is the maximum rate at which a soil, in its current condition, can take in water at its surface.

Step 2 – note how it behaves: It is high when the soil is dry and falls with time as the soil wets up, approaching a steady final value.

Why the other options are wrong:

- B: percolation is the downward movement of water within the soil below the surface.
- C: permeability is a property describing how easily the soil transmits water, not the surface intake rate.
- D: porosity is the fraction of the soil volume that is pore space.

Final Answer: the maximum intake rate is the infiltration capacity $\Rightarrow \boxed{\text{A}}$

Answer: (A) Go Back to Q16

Q17.

Solution

Concept – discharge over a V-notch weir: For a sharp-crested triangular (V-notch) weir the theoretical discharge is $Q = \frac{8}{15} C_d \sqrt{2g} \tan\frac{\theta}{2} H^{5/2}$.

Step 1 – separate the head term: All the terms except H are constants for a given notch, so the discharge depends on the head only through $H^{5/2}$.

Step 2 – state the proportionality: Therefore $Q \propto H^{5/2}$; the discharge rises steeply as the head increases.

Why the other options are wrong:

- A and B: powers $1/2$ and $3/2$ do not match the V-notch integration; $H^{3/2}$ is the law for a rectangular weir.
- D: the exponent for a V-notch is $5/2$, not 2.

Final Answer: $Q \propto H^{5/2} \Rightarrow \boxed{\text{C}}$

Answer: (C) Go Back to Q17

Q18.

Solution

Concept – strip cropping: Erosion can be reduced by alternating strips of crops with different erosion behaviour across the direction of flow or wind.

Step 1 – describe the practice: Strip cropping grows erosion-permitting row crops and erosion-resisting close-growing crops in alternate bands laid out across the slope or across the prevailing wind.

Step 2 – explain the benefit: The protective strips slow the runoff or wind and trap the soil moving off the neighbouring cultivated strips, cutting soil loss.

Why the other options are wrong:

- A: mulching covers the surface with residues; it is not the alternate-band cropping pattern described.
- B: contour bunding builds earthen bunds along contours; it is a mechanical measure, not a cropping pattern.
- C: terracing reshapes the slope into steps; again a mechanical measure.

Final Answer: the practice is strip cropping $\Rightarrow \boxed{\text{D}}$

Answer: (D) Go Back to Q18

Q19.

Solution

Concept – return period and annual exceedance probability: The probability that an event is equalled or exceeded in any one year is the reciprocal of its return period: $P = \dfrac{1}{T}$.

Step 1 – list the data: Return period $T = 25$ years.

Step 2 – take the reciprocal: $P = \dfrac{1}{25}$

Step 3 – evaluate: $P = 0.04$

Step 4 – express as a percentage: $P = 0.04 \times 100 = 4\%$

Final Answer: $P = 4\% \Rightarrow \boxed{\text{C}}$

Answer: (C) Go Back to Q19

Q20.

Solution

Concept – stages of water erosion: Water erosion progresses from splash to sheet to rill to gully erosion; the very first stage is caused by raindrop impact.

Step 1 – identify the first stage: Splash (raindrop) erosion is the detachment of individual soil particles by the impact energy of falling raindrops striking the bare soil.

Why the other options are wrong:

- A: rill erosion is the removal of soil along small well-defined channels, a later stage.
- B: gully erosion is the advanced stage with large channels that cannot be crossed by tillage.
- C: sheet erosion is the fairly uniform removal of a thin soil layer after detachment; it follows splash.

Final Answer: the first stage is splash (raindrop) erosion $\Rightarrow \boxed{\text{D}}$

Answer: (D) Go Back to Q20

Q21.

Solution

Concept – sediment delivery ratio: The sediment delivery ratio (SDR) is the fraction of the gross erosion that is actually delivered as sediment yield at the watershed outlet: sediment yield = SDR × gross erosion.

Step 1 – list the data: Gross erosion $= 1000$ t, SDR $= 0.30$.

Step 2 – write the formula: sediment yield $= 0.30 \times 1000$

Step 3 – evaluate: sediment yield $= 300$ t

Step 4 – interpret: The remaining 700 t is deposited within the watershed and does not reach the outlet.

Final Answer: sediment yield $= 300$ t $\Rightarrow \boxed{\text{B}}$

Answer: (B) Go Back to Q21

Q22.

Solution

Concept – rational method for peak runoff: With A in hectares and i in mm/h, the rational formula in SI form is $Q = \dfrac{C\,i\,A}{360}$ m^3/s.

Step 1 – list the data: $C = 0.50$, $i = 72$ mm/h, $A = 100$ ha.

Step 2 – substitute into the formula: $Q = \dfrac{0.50 \times 72 \times 100}{360}$

Step 3 – multiply the numerator: $0.50 \times 72 = 36$

$36 \times 100 = 3600$

Step 4 – divide by 360: $Q = \dfrac{3600}{360}$

Step 5 – evaluate: $Q = 10.0$ m^3/s

Final Answer: $Q = 10.0$ m^3/s $\Rightarrow \boxed{\text{A}}$

Answer: (A) Go Back to Q22

Q23.

Solution

Concept – discharge by the continuity equation: The discharge in a channel is the flow cross-sectional area times the mean velocity: $Q = A \times V$.

Step 1 – list the data: $A = 6$ m^2, $V = 1.5$ m/s.

Step 2 – substitute into $Q = AV$: $Q = 6 \times 1.5$

Step 3 – evaluate: $Q = 9.0$ m^3/s

Final Answer: $Q = 9.0$ m^3/s $\Rightarrow \boxed{\text{C}}$

Answer: (C) Go Back to Q23

Q24.

Solution

Concept – net irrigation depth from allowed depletion: The net irrigation depth is the fraction of the total available water that is allowed to be depleted before the next irrigation: $d_{net} = \text{MAD} \times \text{TAW}$.

Step 1 – list the data: Total available water TAW $= 200$ mm, allowed depletion MAD $= 50\% = 0.50$.

Step 2 – write the formula: $d_{net} = 0.50 \times 200$

Step 3 – evaluate: $d_{net} = 100$ mm

Final Answer: $d_{net} = 100 \text{ mm} \Rightarrow \boxed{\text{D}}$

Answer: (D) Go Back to Q24

Q25.

Solution

Concept – relation between delta, duty and base period: The depth of water (delta) delivered to a crop is related to the duty D (ha/cumec) and base period B (days) by $\Delta = \dfrac{8.64\,B}{D}$ metres.

Step 1 – list the data: $B = 100$ days, $D = 864$ ha/cumec.

Step 2 – substitute into the formula: $\Delta = \dfrac{8.64 \times 100}{864}$

Step 3 – multiply the numerator: $8.64 \times 100 = 864$

Step 4 – divide: $\Delta = \dfrac{864}{864} = 1.0$ m

Step 5 – convert to centimetres: $\Delta = 1.0 \times 100 = 100$ cm

Final Answer: $\Delta = 100 \text{ cm} \Rightarrow \boxed{\text{C}}$

Answer: (C) Go Back to Q25

Q26.

Solution

Concept – irrigation interval (frequency): The interval between irrigations is the net depth applied divided by the daily consumptive-use rate: $f = \dfrac{d_{net}}{\text{ET}}$.

Step 1 – list the data: $d_{net} = 60$ mm, $\text{ET} = 5$ mm/day.

Step 2 – write the formula: $f = \dfrac{60}{5}$

Step 3 – carry out the division: $f = 12$

Step 4 – attach the unit: $f = 12$ days

Final Answer: $f = 12 \text{ days} \Rightarrow \boxed{\text{D}}$

Answer: (D) Go Back to Q26

Q27.

Solution

Concept – water (hydraulic) 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 and convert: $Q = 50$ L/s $= 0.05$ m^3/s, $H = 10$ m, $\rho_w = 1000$ kg/m^3, $g = 9.81$ m/s^2.

Step 2 – substitute into $P = \rho_w g Q H$: $P = 1000 \times 9.81 \times 0.05 \times 10$

Step 3 – multiply step by step: $1000 \times 9.81 = 9810$

$9810 \times 0.05 = 490.5$

$490.5 \times 10 = 4905$

Step 4 – state the result in watts: $P = 4905$ W

Step 5 – convert to kilowatts: $P = 4.905$ kW ≈ 4.9 kW

Final Answer: $P \approx 4.9$ kW $\Rightarrow \boxed{\text{A}}$

Answer: (A) Go Back to Q27

Q28.

Solution

Concept – total static head of a pump: When friction losses are neglected, the total static head is simply the sum of the static suction lift and the static delivery lift: $H = h_s + h_d$.

Step 1 – list the data: Suction lift $h_s = 4$ m, delivery lift $h_d = 16$ m.

Step 2 – add the two lifts: $H = 4 + 16$

Step 3 – evaluate: $H = 20$ m

Final Answer: $H = 20$ m $\Rightarrow \boxed{\text{A}}$

Answer: (A) Go Back to Q28

Q29.

Solution

Concept – Darcy's law for groundwater flow: The volumetric flow rate through a porous medium is $Q = K \, i \, A$, where K is the hydraulic conductivity, i the hydraulic gradient and A the flow area.

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

Step 2 – substitute into $Q = KiA$: $Q = 20 \times 0.01 \times 50$

Step 3 – multiply the first two factors: $20 \times 0.01 = 0.2$

Step 4 – multiply by the area: $0.2 \times 50 = 10$

Step 5 – attach the unit: $Q = 10\ \text{m}^3/\text{day}$

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

Answer: (B) Go Back to Q29

Q30.

Solution

Concept – pump affinity law for head: For the same pump, 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: $H_1 = 16$ 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 by the original head: $H_2 = 16 \times 4$

Step 5 – evaluate: $H_2 = 64$ m

Final Answer: $H_2 = 64\ \text{m} \Rightarrow \boxed{\text{B}}$

Answer: (B) Go Back to Q30

Q31.

Solution

Concept – design discharge from a drainage coefficient: The drainage coefficient is the depth of water to be removed per day; the discharge is this depth times the area divided by the seconds in a day: $Q = \frac{d \times A}{86400}$.

Step 1 – list the data and convert: $d = 1.2$ cm/day $= 0.012$ m/day, $A = 100$ ha $= 100 \times 10000 = 1{,}000{,}000\ \text{m}^2$.

Step 2 – find the daily volume: $V = 0.012 \times 1{,}000{,}000$

$V = 12000\ \text{m}^3/\text{day}$

Step 3 – divide by seconds per day: $Q = \frac{12000}{86400}$

Step 4 – evaluate: $Q = 0.139\ \text{m}^3/\text{s}$

Final Answer: $Q \approx 0.139\ \text{m}^3/\text{s} \Rightarrow \boxed{\text{A}}$

Answer: (A) Go Back to Q31

Q32.

Solution

Concept – sprinkler application rate: The application rate is the sprinkler discharge spread over the area it wets, expressed as a depth per unit time: rate $= \dfrac{q}{\text{area}}$.

Step 1 – list the data and convert: $q = 0.5$ L/s $= 0.0005$ m^3/s, area $= 10 \times 10 = 100$ m^2.

Step 2 – divide discharge by area: rate $= \dfrac{0.0005}{100}$

rate $= 5 \times 10^{-6}$ m/s

Step 3 – convert metres to millimetres: 5×10^{-6} m/s $= 5 \times 10^{-3}$ mm/s

Step 4 – convert seconds to hours: $5 \times 10^{-3} \times 3600 = 18$ mm/h

Final Answer: application rate $= 18$ mm/h $\Rightarrow \boxed{\text{B}}$

Answer: (B) Go Back to Q32

Q33.

Solution

Concept – depth of water applied to a field: The depth applied is the total volume of water delivered divided by the field area: $d = \dfrac{Q \times t}{A}$.

Step 1 – list the data and convert: $Q = 30$ L/s $= 0.03$ m^3/s, $t = 2$ h $= 7200$ s, $A = 0.5$ ha $= 5000$ m^2.

Step 2 – find the volume of water applied: $V = 0.03 \times 7200$

$V = 216$ m^3

Step 3 – divide by the field area: $d = \dfrac{216}{5000}$

Step 4 – evaluate in metres: $d = 0.0432$ m

Step 5 – convert to millimetres: $d = 0.0432 \times 1000 = 43.2$ mm

Final Answer: $d = 43.2$ mm $\Rightarrow \boxed{\text{C}}$

Answer: (C) Go Back to Q33

Q34.

Solution

Concept – leaching requirement: The leaching requirement is the ratio of the electrical conductivity of the irrigation water to that of the drainage water the crop can tolerate: $\text{LR} = \dfrac{EC_{iw}}{EC_{dw}}$.

Step 1 – list the data: $EC_{iw} = 2$ dS/m, $EC_{dw} = 10$ dS/m.

Step 2 – substitute into the formula: $\text{LR} = \dfrac{2}{10}$

Step 3 – evaluate: $\text{LR} = 0.2$

Step 4 – interpret: About 20% of the applied water must drain below the root zone to keep the root-zone salinity within the crop's tolerance.

Final Answer: $\text{LR} = 0.2 \Rightarrow \boxed{\text{B}}$

Answer: (B) Go Back to Q34

Q35.

Solution

Concept – converting wet basis to dry basis: The dry-basis moisture content is obtained from the wet-basis value by $M_{db} = \dfrac{M_{wb}}{1 - M_{wb}}$, with M_{wb} as a fraction.

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

Step 2 – form the denominator: $1 - 0.20 = 0.80$

Step 3 – substitute into the formula: $M_{db} = \dfrac{0.20}{0.80}$

Step 4 – evaluate: $M_{db} = 0.25$

Step 5 – express as a percentage: $M_{db} = 0.25 \times 100 = 25\%$

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

Answer: (A) Go Back to Q35

Q36.

Solution

Concept – water removed in drying (mass balance): The bone-dry matter is unchanged during drying, so the water removed is $W_{removed} = W_i \times \dfrac{M_1 - M_2}{100 - M_2}$, with M_1, M_2 wet-basis percentages.

Step 1 – list the data: Initial mass $W_i = 100$ kg, $M_1 = 24\%$, $M_2 = 12\%$.

Step 2 – form the numerator of the fraction: $M_1 - M_2 = 24 - 12 = 12$

Step 3 – form the denominator of the fraction: $100 - M_2 = 100 - 12 = 88$

Step 4 – substitute into the formula: $W_{removed} = 100 \times \dfrac{12}{88}$

Step 5 – simplify: $W_{removed} = \dfrac{1200}{88}$

Step 6 – evaluate: $W_{removed} = 13.6$ kg

Final Answer: $W_{removed} \approx 13.6$ kg $\Rightarrow \boxed{\text{D}}$

Answer: (D) Go Back to Q36

Q37.

Solution

Concept – porosity of a grain bed: Porosity is the fraction of the bulk volume that is pore space, obtained from the bulk and true densities: $\varepsilon = 1 - \dfrac{\rho_{bulk}}{\rho_{true}}$.

Step 1 – list the data: $\rho_{bulk} = 1200$ kg/m^3, $\rho_{true} = 1500$ kg/m^3.

Step 2 – form the density ratio: $\dfrac{\rho_{bulk}}{\rho_{true}} = \dfrac{1200}{1500} = 0.80$

Step 3 – subtract from one: $\varepsilon = 1 - 0.80 = 0.20$

Step 4 – express as a percentage: $\varepsilon = 0.20 \times 100 = 20\%$

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

Answer: (C) Go Back to Q37

Q38.

Solution

Concept – laws of size reduction: Three classical laws relate the energy of grinding to the sizes involved: Rittinger's (surface), Kick's (volume/ratio) and Bond's (intermediate).

Step 1 – identify the size-ratio law: Kick's law states that the energy required is proportional to the logarithm of the ratio of the initial to the final size, i.e. to the size-reduction ratio.

Why the other options are wrong:

- B: Rittinger's law makes the energy proportional to the new surface area created, not to the size ratio.
- C: Bond's law makes the energy proportional to the difference in the reciprocals of the square roots of the sizes.
- D: Stokes' law describes the settling of small particles in a fluid, not size

reduction.

Final Answer: the size-ratio law is Kick's law $\Rightarrow \boxed{\text{A}}$

Answer: (A) Go Back to Q38

Q39.

Solution

Concept – heat to evaporate water: The heat needed just to evaporate water is the mass of water times its latent heat of vaporisation: $Q = m \times h_{fg}$.

Step 1 – list the data: $m = 10$ kg, $h_{fg} = 2260$ kJ/kg.

Step 2 – substitute into $Q = m\,h_{fg}$**:** $Q = 10 \times 2260$

Step 3 – evaluate in kilojoules: $Q = 22600$ kJ

Step 4 – convert to megajoules: $Q = \dfrac{22600}{1000} = 22.6$ MJ

Final Answer: $Q = 22.6$ MJ $\Rightarrow \boxed{\text{A}}$

Answer: (A) Go Back to Q39

Q40.

Solution

Concept – flow arrangements in a heat exchanger: When the two fluids move in opposite directions the exchanger is a counter-flow unit; when they move in the same direction it is a parallel-flow unit.

Step 1 – read the flow directions: In the figure the hot inner fluid flows left to right while the cold annulus fluid flows right to left, so the streams are opposed.

Step 2 – name the arrangement: Opposed streams make this a counter-flow heat exchanger.

Step 3 – state its advantage: For the same terminal temperatures, counter flow keeps the temperature difference more uniform along the length, giving a larger log-mean temperature difference and thus a higher heat-transfer rate than parallel flow.

Why the other options are wrong:

- A: parallel flow describes streams in the same direction, which is not the case here.
- C: cross flow has the streams at right angles, not opposed along one pipe.

- D: "mixed flow with equal inlet temperatures" does not describe this simple opposed-flow tube.

Final Answer: it is counter flow with a larger LMTD $\Rightarrow \boxed{\text{B}}$

Answer: (B) Go Back to Q40

Q41.

Solution

Concept – sensible heat removed in cooling: Above the freezing point, the heat removed to cool a product is $Q = m\,c\,\Delta T$, with m the mass, c the specific heat and ΔT the temperature drop.

Step 1 – list the data: $m = 200$ kg, $c = 3.6$ kJ/kg $\cdot$ K, $\Delta T = 30 - 5 = 25$ K.

Step 2 – substitute into $Q = mc\Delta T$: $Q = 200 \times 3.6 \times 25$

Step 3 – multiply step by step: $200 \times 3.6 = 720$

$720 \times 25 = 18000$

Step 4 – state the result in kilojoules: $Q = 18000$ kJ

Step 5 – convert to megajoules: $Q = \dfrac{18000}{1000} = 18$ MJ

Final Answer: $Q = 18$ MJ $\Rightarrow \boxed{\text{B}}$

Answer: (B) Go Back to Q41

Q42.

Solution

Concept – steady conduction through a plane wall (Fourier's law): $Q = \dfrac{k\,A\,\Delta T}{L}$, with k the conductivity, A the area, ΔT the face-to-face temperature difference and L the thickness.

Step 1 – list the data: $k = 0.04$ W/m $\cdot$ K, $A = 10$ m^2, $\Delta T = 25 - 0 = 25$ K, $L = 0.1$ m.

Step 2 – form the numerator $kA\Delta T$: $kA = 0.04 \times 10 = 0.4$

$0.4 \times 25 = 10$

Step 3 – divide by the thickness: $Q = \dfrac{10}{0.1}$

Step 4 – evaluate: $Q = 100$ W

Final Answer: $Q = 100$ W $\Rightarrow \boxed{\text{A}}$

Answer: (A) Go Back to Q42

Q43.

Solution

Concept – relative humidity from vapour pressures: Relative humidity is the ratio of the actual water-vapour partial pressure to the saturation vapour pressure at the same temperature: $\text{RH} = \frac{p_v}{p_s} \times 100$.

Step 1 – list the data: $p_v = 2.0$ kPa, $p_s = 5.0$ kPa.

Step 2 – form the ratio: $\frac{p_v}{p_s} = \frac{2.0}{5.0}$

Step 3 – simplify: $\frac{2.0}{5.0} = 0.40$

Step 4 – express as a percentage: $\text{RH} = 0.40 \times 100 = 40\%$

Final Answer: $\text{RH} = 40\% \Rightarrow \boxed{\text{C}}$

Answer: (C) Go Back to Q43

Q44.

Solution

Concept – principle of a cyclone separator: A cyclone spins the dust-laden air so that inertia throws the heavier particles outward against the wall.

Step 1 – describe the motion: The tangential entry makes the air spiral rapidly inside the conical body, setting up a strong rotational (vortex) flow.

Step 2 – identify the separating action: The centrifugal force of this rotation flings the heavier particles to the wall, from where they fall to the bottom collector, while the lighter clean air rises and leaves at the top.

Why the other options are wrong:

- A: plain gravity settling is far too slow for the fine, fast-moving particles a cyclone handles.
- B: magnetic attraction works only on magnetic materials, not general dust.
- D: electrostatic attraction is the basis of an electrostatic precipitator, not a cyclone.

Final Answer: the cyclone separates by centrifugal force $\Rightarrow \boxed{\text{C}}$

Answer: (C) Go Back to Q44

Q45.

Solution

Concept – spray drying: Liquid foods can be dried very fast by turning them into a fine mist and contacting them with hot air.

Step 1 – describe the operation: In spray drying the feed liquid or slurry is atomised into fine droplets by a nozzle or spinning disc and meets a stream of hot air; the large droplet surface lets the water evaporate almost instantly, leaving a dry powder.

Why the other options are wrong:

- A: freeze drying removes water by sublimation from the frozen state, not by hot-air atomisation.
- C: drum drying spreads a thin film of the liquid on a heated rotating drum; there is no atomisation.
- D: tray drying dries solid pieces spread on trays, not an atomised liquid.

Final Answer: the operation is spray drying $\Rightarrow \boxed{\text{B}}$

Answer: (B) Go Back to Q45

Q46.

Solution

Concept – critical moisture content on the drying-rate curve: The drying-rate curve has a constant-rate period at higher moisture and a falling-rate period at lower moisture; the moisture at the changeover has a specific name.

Step 1 – locate the marked point: The marked point is where the horizontal constant-rate portion ends and the rate starts to fall.

Step 2 – name that moisture content: The moisture content at this changeover is the critical moisture content; below it the surface can no longer stay fully wet, so the drying rate drops.

Why the other options are wrong:

- A: the equilibrium moisture content is the final value reached at the very end of drying, where the rate is zero.
- B: bound moisture is water held by the solid at a vapour pressure below that of free water; it is not this transition point.
- C: free moisture is the moisture above the equilibrium value that can be removed; it is not the transition point.

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

Answer: (D) Go Back to Q46

Answer Key

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