SDO / Assistant Director (Mechanical) — 2025 · Solved Past Paper

Body: Balochistan Public Service Commission (BPSC) · **Post:** SDO / Assistant Director (Mechanical) · **Year:** 2025 · **Questions:** 70 in the original paper — **69 solved and verified**, 1 excluded as defective (Q43) · **Price:** Free

> **How to use this paper:** each question shows the stem, the four options, and the correct answer. Click “Why each option?” under a question to see all four options explained — one question teaches four topics. General Knowledge answers are as of the 2025 sitting.

Source note: testpointpk reproduction, 'BPSC SDO, AD Mechanical Past Paper 27-05-2025' (70 items, served order Q1–Q70) primary; no second source — every answer checked independently of the printed key. 9 printed keys corrected openly (including Q1: in blanking the shear angle is provided on the die face only, corrected to B Die only). 1 DEFECTIVE-excluded (Q43: dynamic similarity is similarity of forces — no force option is offered; similarity of velocities is kinematic similarity). All decisions by the assistant under the owner's 8 Nov 2026 delegation.

Question 1 Mechanical Engineering (Manufacturing)

In blanking operation, the angle of shear is provided on _____?

- A. Depends on the material of work piece
- B. Die only ✓ **Correct answer**
- C. Punch only
- D. Both on die and punch

A. Wrong: where the shear is put depends on which operation is being done (blanking or piercing), not on the workpiece material.

In blanking the shear angle is ground on the die face, so that the blank — the wanted part — stays flat; shear on the punch would distort the blank.

C. Wrong: shear on the punch is the rule for piercing/punching, where the hole is the scrap, not for blanking.

D. Wrong: shear is put on one member only, never both, because it distorts whichever piece it is put on (the testpointpk key D is wrong — see verification summary). Printed-key correction: testpointpk keys D 'Both on die and punch'; corrected to B 'Die only' (see verification summary).

Question 2 Mechanical Engineering (Metallurgy)

Process of austempering results in formation of _____?

- A. Martensite structure
- B. Bainite structure ✓ **Correct answer**
- C. Carburized structure
- D. None of the above

A. Wrong: martensite forms by quenching to room temperature (martempering/quenching), not by austempering.

B. Correct: austempering holds the steel in a salt bath at about 250–550 °C so that austenite transforms to bainite, giving a tough, ductile structure without quench cracking.

C. Wrong: carburizing adds carbon to the surface of low-carbon steel; it is a case-hardening process, not what austempering produces.

D. Wrong: bainite is among the options and is correct.

Question 3 Mechanical Engineering (Manufacturing)

Filler metal is used in _____?

- A. Gas welding ✓ **Correct answer**

- C. Spot welding
- D. None of these

A. Correct: in gas (oxy-acetylene) welding a filler rod is melted into the joint to supply extra metal.

B. Wrong: seam welding is a resistance-welding process that joins overlapping sheets by its own melted metal; no filler metal is added.

C. Wrong: spot welding is also resistance welding and uses no filler metal — the joint is made by the resistance heat of the sheets themselves.

D. Wrong: gas welding is among the options and is correct.

Question 4 Mechanical Engineering (Manufacturing)

The plastic articles are usually produced by _____?

- A. Injection moulding ✓ **Correct answer**
- B. Shell moulding
- C. Green sand moulding
- D. None of these

A. Correct: most plastic articles (bottles, caps, housings, toys) are made by injecting molten plastic into a mould.

B. Wrong: shell moulding is a metal-casting process using a resin-coated sand shell, not a plastics process.

C. Wrong: green sand moulding is also a metal-casting process (moist sand moulds for molten metal), not for plastics.

D. Wrong: injection moulding is among the options and is correct.

5 Mechanical Engineering (Manufacturing)

Permeability is poor for _____?

- A. Rounded
- B. Fine grains ✓ **Correct answer**
- C. Medium
- D. None of these

A. Wrong: rounded grains leave larger, more open passages between them, so permeability is good, not poor.

B. Correct: fine sand grains pack closely and leave only tiny passages, so gases escape slowly — permeability is poor.

C. Wrong: medium grains give medium permeability, not poor permeability.

D. Wrong: fine grains is among the options and is correct.

Question 6 Mechanical Engineering (Manufacturing)

In drop forging, forging is done by dropping _____?

- A. A weight on hammer to produce the requisite impact
- B. The work piece at high velocity
- C. The hammer at high velocity ✓ **Correct answer**
- D. None of these

A. Wrong: no separate weight is placed on the hammer; the hammer itself is the falling weight (the testpointpk key A is wrong — see verification summary).

B. Wrong: the workpiece sits still on the lower die; it is never dropped.

C. Correct: in drop forging the upper die, carried by the hammer, is lifted and dropped at high velocity onto the heated workpiece, and the impact forces the metal into the die shape.

e hammer at high velocity is among the options and is correct. Printed-key correction: testpointpk keys A 'A weight on hammer to produce the requisite impact'; corrected to C 'The hammer at high velocity' (see verification summary).

Question 7 Mechanical Engineering (Manufacturing)

Stamping is the process of _____?

- A. Printing letters and numbers on metal sheets
- B. Producing seamless tubes
- C. Shaping thin sheets by pressing them against a form ✓ **Correct answer**
- D. None of these

A. Wrong: printing letters and numbers on sheet metal is marking or embossing, not stamping as a forming process.

B. Wrong: seamless tubes are made by extrusion, piercing or drawing, not by stamping.

C. Correct: stamping presses thin sheet metal between a punch and a die (form) to shape it.

D. Wrong: shaping thin sheets by pressing is among the options and is correct.

Question 8 Mechanical Engineering (Machine Design)

Which key is used for light duty work?

- A. Feather key
- B. Saddle key ✓ **Correct answer**
- C. Sunk key
- D. All of the above

A. Wrong: a feather key is a parallel sunk key that lets the hub slide axially while transmitting torque; it is a general-duty key, not the light-duty one.

B. Correct: a saddle key sits in the hub keyway only and holds by friction on the shaft

can slip under load and is used only for comparatively light loads.

C. Wrong: a sunk key fits half in the shaft and half in the hub and transmits full torque; it is the standard general-duty key.

D. Wrong: only the saddle key is the light-duty key.

Question 9 Mechanical Engineering (Machine Design)

Residual stresses are present in _____?

- A. Forged shafts
- B. Cold rolled shaft ✓ **Correct answer**
- C. Cast shafts
- D. None of these

A. Wrong: forging is done hot, so the metal is soft enough for stresses to relax; forged shafts have comparatively low residual stresses.

B. Correct: cold rolling deforms the metal at room temperature, leaving high residual stresses locked in — the standard machine-design text (Khurmi) states cold-rolled shafts are stronger than hot-rolled ones but carry higher residual stresses.

C. Wrong: castings cool slowly and are usually stress-relieved; their residual stresses are lower than those of a cold-rolled shaft.

D. Wrong: the cold rolled shaft is among the options and is correct.

Question 10 General Science (Chemistry)

Alloy in which mercury is one of the metals are called?

- A. Magnallum
- B. Emulsions
- C. Amalgams ✓ **Correct answer**
- D. None of these

agnallum is an aluminium–magnesium alloy (used for light castings); it contains no mercury (the testpointpk key A is wrong — see verification summary).

B. Wrong: an emulsion is a mixture of two immiscible liquids (like oil in water), not an alloy at all.

C. Correct: any alloy in which mercury is one of the metals is an amalgam (the classic example is dental amalgam, silver–tin with mercury).

D. Wrong: amalgams is among the options and is correct. Printed-key correction: testpointpk keys A 'Magnallum'; corrected to C 'Amalgams' (see verification summary).

Question 11 Mechanical Engineering (Metallurgy)

Maximum surface hardness is attained by _____?

- A. Nitriding ✓ **Correct answer**
- B. Cyaniding
- C. Carbonizing
- D. None of these

A. Correct: nitriding diffuses nitrogen into the steel surface, forming very hard nitrides and giving the highest surface hardness of the case-hardening processes (about 1000–1200 HV), with no quenching distortion.

B. Wrong: cyaniding (carbon + nitrogen in a cyanide bath) gives a hard case, but not as hard as nitriding.

C. Wrong: "carbonizing" here means carburizing — adding carbon to the surface — which gives a hard case after quenching, but a lower surface hardness than nitriding.

D. Wrong: nitriding is among the options and is correct.

12 Mechanical Engineering (Metallurgy)

The lime stone is added in blast furnace to _____?

- A. Magnesium oxide
- B. Sulphur
- C. Silicon oxide ✓ **Correct answer**
- D. None of these

A. Wrong: limestone is not added to deal with magnesium oxide; magnesia is not the impurity the flux targets.

B. Wrong: sulphur is removed mainly by the coke and by the lime reacting with it, but the flux's chief target named in the options is silica, not sulphur.

C. Correct: limestone decomposes to lime (CaO), which reacts with silica, SiO_2 (silicon oxide, the main gangue impurity), to form calcium silicate slag: $CaO + SiO_2 \rightarrow CaSiO_3$.

D. Wrong: silicon oxide is among the options and is correct.

Question 13 Mechanical Engineering (Theory of Machines)

The force of friction between two bodies in contact is _____?

- A. Independent of the apparent area of contact ✓ **Correct answer**
- B. Dependent on the areas of contact
- C. Function of the relative velocity between them
- D. Always normal to the surface of contact

A. Correct: this is Coulomb's law of friction — the friction force depends on the normal load and the surfaces, not on how large the apparent contact area is.

B. Wrong: this contradicts Coulomb's law; doubling the apparent area at the same load does not double the friction force.

C. Wrong: in dry (Coulomb) friction the force is roughly the same at any sliding speed; it is

n of velocity (that is true of viscous friction, not dry friction).

D. Wrong: the friction force acts TANGENT to the surface, opposing motion; the NORMAL force is a separate force.

Question 14 Industrial Engineering

In what way increase in productivity helps the management?

- A. Reduced price of the articles
- B. Better working conditions
- C. To stand better in market ✓ **Correct answer**
- D. None of these

A. Wrong: higher productivity CAN allow lower prices, but the textbook answer for how it helps management is the competitive position, not the price itself.

B. Wrong: better working conditions are a possible side benefit for workers, not the management advantage the question asks for.

C. Correct: higher productivity means lower cost per unit and better quality, so the firm can compete more strongly and stand better in the market.

D. Wrong: standing better in the market is among the options and is correct.

Question 15 Mechanical Engineering (Metrology)

Gear tooth vernier is used to measure _____ of tooth.

- A. Circular pitch
- B. Depth
- C. Pitch line thickness ✓ **Correct answer**
- D. None of these

A. Wrong: circular pitch is the distance along the pitch circle between corresponding points on adjacent teeth; the gear tooth vernier does not measure it.

e vertical slide of the vernier is only SET to the depth (chordal addendum) at which the thickness is measured; depth is not the quantity the instrument is for.

C. Correct: the gear tooth vernier measures the chordal (pitch line) thickness of the tooth — the width of the tooth at the pitch circle.

D. Wrong: pitch line thickness is among the options and is correct.

Question 16 Mechanical Engineering (Metrology)

All of the following devices can be used for testing the straightness of a surface, except?

- A. Beam comparator
- B. Optical gauge ✓ **Correct answer**
- C. Spirit level
- D. Auto-collimator

A. Wrong as the exception: the beam comparator IS a recognised straightness-testing instrument (IS 12937 lists it).

B. Correct as the exception: an optical gauge measures dimensions optically; it is not one of the straightness-testing instruments (beam comparator, precision/spirit level, autocollimator).

C. Wrong as the exception: the spirit (precision) level IS used for straightness by the inclination (step-by-step) method under IS 12937 (the testpointpk key C is wrong — see verification summary).

D. Wrong as the exception: the autocollimator IS a standard straightness instrument, measuring the small angular tilts of a block moved along the surface. Printed-key correction: testpointpk keys C 'Spirit level'; corrected to B 'Optical gauge' (see verification summary).

17 Mechanical Engineering (Metrology)

V-block is used in a workshop to check _____?

- A. Angularity of job from vertical position
- B. Dimension of an oval job
- C. Roundness of a cylindrical block ✓ **Correct answer**
- D. None of these

A. Wrong: angularity is checked with a sine bar, bevel protractor or angle plate, not a V-block.

B. Wrong: a V-block holds round work; it is not a measuring tool for oval dimensions.

C. Correct: a cylindrical job is laid in the V of the block and rotated under a dial indicator; any out-of-roundness shows as indicator movement.

D. Wrong: roundness of a cylindrical block is among the options and is correct.

Question 18 Mechanical Engineering (Metrology)

The amount of moisture in air can be measured by _____?

- A. Photometer
- B. Thermistor
- C. Sling psychrometer ✓ **Correct answer**
- D. None of these

A. Wrong: a photometer measures light intensity, not moisture.

B. Wrong: a thermistor is a temperature-sensitive resistor; it measures temperature, not humidity.

C. Correct: a sling psychrometer has a dry-bulb and a wet-bulb thermometer whirled in the air; the difference between their readings gives the humidity (moisture content).

D. Wrong: the sling psychrometer is among the options and is correct.

19 Mechanical Engineering (Metrology)

The measurement of a speed of a rotating shaft by means of an electric tachometer is a _____?

- A. Tertiary measurement ✓ **Correct answer**
- B. Direct measurement
- C. Non-contact type measurement
- D. None of these

A. Correct: a tertiary measurement involves TWO conversions — here the shaft speed is first converted into an electrical voltage and the voltage is then converted into the movement of a voltmeter pointer; the electric tachometer is the textbook example of a tertiary measurement.

B. Wrong: the speed is never compared directly with a standard; it is inferred through two conversions (the testpointpk key B is wrong — see verification summary).

C. Wrong: "non-contact" describes whether the instrument touches the job, not the measurement class; an electric tachometer is usually coupled to the shaft, and the question asks for the measurement class.

D. Wrong: tertiary measurement is among the options and is correct. Printed-key correction: testpointpk keys B 'Direct measurement'; corrected to A 'Tertiary measurement' (see verification summary).

Question 20 Mechanical Engineering (Material Handling)

Lifting magnets are used as material handling devices for _____?

- A. Tubes
- B. Pig iron
- C. Billets
- D. All of the above ✓ **Correct answer**

A. Partial: steel tubes are ferromagnetic and can be lifted by a lifting magnet, but they are not the only material.

B. True but partial: pig iron is ferromagnetic and is handled by lifting magnets, but it is not the only material.

C. True but partial: steel billets are a classic load for lifting magnets, but they are not the only material.

D. Correct: lifting magnets handle any ferromagnetic load — tubes, pig iron and billets alike.

Question 21 General Science (Physics)

Which of the following is not directly related to the phenomenon of evaporation?

- A. Surface winds over the liquid
- B. Temperature of liquid
- C. Volume of the liquid ✓ **Correct answer**
- D. Surface area of the liquid

A. Wrong as the exception: wind sweeps vapour away from the surface and speeds evaporation, so it IS directly related.

B. Wrong as the exception: higher temperature gives more molecules enough energy to escape, so it IS directly related.

C. Correct as the exception: evaporation happens only at the surface; how deep the liquid is (its volume) does not change the rate of evaporation.

D. Wrong as the exception: a larger surface lets more molecules escape at once, so it IS directly related.

22 General Science (Chemistry)

Which of the following is considered as the noble gas?

- A. Argon ✓ **Correct answer**
- B. Oxygen
- C. Ozone
- D. Hydrogen

A. Correct: argon is a Group 18 noble gas — chemically inert, with a full outer shell.

B. Wrong: oxygen is a highly reactive gas (Group 16), the opposite of a noble gas.

C. Wrong: ozone (O_3) is a reactive form of oxygen, not a noble gas.

D. Wrong: hydrogen is a reactive gas (Group 1), not a noble gas.

Question 23 Mechanical Engineering (Metrology)

Environmental errors may be due to changes in _____?

- A. Humidity
- B. Pressure and temperature
- C. Wind velocity and gravity
- D. Any one of these parameters ✓ **Correct answer**

A. True but partial: changes in humidity do cause environmental errors, but they are not the only cause.

B. True but partial: changes in pressure and temperature do cause environmental errors, but they are not the only cause.

C. True but partial: wind and gravity changes can cause environmental errors, but they are not the only cause.

D. Correct: environmental errors arise from changes in any of these — humidity, pressure, temperature, wind or gravity.

24 General Science (Physics)

Which of the following physical quantities is not a vector?

- A. Acceleration
- B. Mass ✓ **Correct answer**
- C. Momentum
- D. Impulse

A. Wrong as the answer: acceleration has magnitude and direction, so it IS a vector.

B. Correct: mass has magnitude only and no direction, so it is a scalar, not a vector.

C. Wrong as the answer: momentum (mass × velocity) has direction, so it IS a vector.

D. Wrong as the answer: impulse (force × time) has direction, so it IS a vector.

Question 25 General Science (Environmental Engineering)

The presence of algae in water indicates that the water is _____?

- A. Acidic ✓ **Correct answer**
- B. Hard
- C. Soft
- D. None of these

A. Correct: the standard environmental-engineering answer is that algae growth indicates acidity — an increase in water acidity initially causes a general increase in algae.

B. Wrong: hardness is caused by dissolved calcium and magnesium salts, not by algae.

C. Wrong: soft water is simply water low in calcium and magnesium; algae do not indicate softness (the testpointpk key C is wrong — see verification summary).

D. Wrong: acidic is among the options and is correct. Printed-key correction: testpointpk keys C 'Soft'; corrected to A 'Acidic' (see verification summary).

26 Mechanical Engineering (Metrology)

The errors which form inexperience of the observer are known as _____?

- A. Mistakes
- B. Handling errors
- C. Personal errors ✓ **Correct answer**
- D. None of these

A. Wrong: mistakes are gross blunders (like misreading a scale), not the systematic errors of an inexperienced observer.

B. Wrong: handling errors come from mishandling the instrument, not from the observer's inexperience.

C. Correct: errors that arise from the observer himself — inexperience, carelessness, bias in reading — are called personal errors.

D. Wrong: personal errors is among the options and is correct.

Question 27 Thermodynamics

One BTU is the amount of energy required to raise the temperature of _____?

- A. One pound of water through 1°F ✓ **Correct answer**
- B. One gram of water through 1°C
- C. One gram of water through 1°F
- D. None of these

A. Correct: by definition, one British Thermal Unit is the heat needed to raise one pound of water by one degree Fahrenheit.

B. Wrong: that is the definition of the (small) calorie, not the BTU.

C. Wrong: no standard unit is defined this way; the BTU uses pounds and Fahrenheit.

D. Wrong: one pound of water through 1°F is among the options and is correct.

28 Thermodynamics

For complete burning of 1 kg of carbon, the air required will be about _____?

- A. 14.5 kg
- B. 2.67 kg
- C. 11.6 kg ✓ **Correct answer**
- D. None of these

A. Wrong: this is too much air; the worked figure is about 11.6 kg.

B. Wrong: 2.67 kg is the mass of OXYGEN needed ($C + O_2 \rightarrow CO_2$: 12 kg C needs 32 kg O_2, so 1 kg C needs 2.67 kg O_2), not the mass of air.

C. Correct: air is only about 23% oxygen by mass, so $2.67 \div 0.23 \approx 11.6$ kg of air is needed per kg of carbon.

D. Wrong: 11.6 kg is among the options and is correct.

Question 29 Thermodynamics

Second law of thermodynamics defines _____?

- A. Internal energy
- B. Entropy ✓ **Correct answer**
- C. Enthalpy
- D. None of these

A. Wrong: internal energy is defined by the FIRST law of thermodynamics (energy conservation).

B. Correct: the second law introduces entropy — the measure of disorder — and states that the entropy of an isolated system never decreases.

C. Wrong: enthalpy ($H = U + pV$) is a property defined for convenience in constant-pressure processes, not by the second law.

ntropy is among the options and is correct.

Question 30 Thermodynamics

Which one of the following is the extensive property of a thermodynamic system?

- A. Density
- B. Volume ✓ **Correct answer**
- C. Pressure
- D. None of these

A. Wrong: density (mass per unit volume) does not change when the system is doubled, so it is an INTENSIVE property.

B. Correct: volume doubles when the amount of substance doubles, so it depends on the size of the system — an extensive property.

C. Wrong: pressure is the same throughout a uniform system however large it is, so it is an intensive property.

D. Wrong: volume is among the options and is correct.

Question 31 Fluid Mechanics

Chances of occurrence of cavitation are high if _____?

- A. Local pressure falls below the vapor pressure ✓ **Correct answer**
- B. Local pressure becomes very high
- C. Local temperature becomes low
- D. None of these

A. Correct: cavitation is the formation of vapour bubbles when the local pressure in a flowing liquid drops below its vapour pressure; the bubbles later collapse violently.

B. Wrong: high pressure suppresses bubble formation; cavitation needs LOW pressure.

w temperature LOWERS the vapour pressure, making cavitation less likely; high temperature favours it.

D. Wrong: local pressure falling below vapour pressure is among the options and is correct.

Question 32 Fluid Mechanics

A pelton wheel is ideally suited for _____?

- A. Medium head and medium discharge
- B. High head and low discharge ✓ **Correct answer**
- C. High head and high discharge
- D. None of these

A. Wrong: medium head and medium discharge suit a Francis turbine, not a Pelton wheel.

B. Correct: the Pelton (impulse) turbine works with a high-pressure jet from a high head, using a small quantity of water — high head, low discharge.

C. Wrong: high head with high discharge would give enormous power and suits no single impulse wheel; a Pelton uses low discharge.

D. Wrong: high head and low discharge is among the options and is correct.

Question 33 Fluid Mechanics

A pitot tube measures _____?

- A. Difference between total and dynamic pressure
- B. Static pressure
- C. Dynamic pressure ✓ **Correct answer**
- D. None of these

A. Wrong: total pressure minus dynamic pressure equals the STATIC pressure (pt − q = ps), not what the pitot tube is for (the testpointpk key A is wrong — see verification

B. Wrong: static pressure is read by the side holes of a pitot-static tube (or a wall tapping), not by the pitot tube itself.

C. Correct: the pitot-static tube reads total pressure at its tip and static pressure at its side holes; the difference, pt − ps, is the dynamic pressure q = ½ρV², from which the flow velocity is found.

D. Wrong: dynamic pressure is among the options and is correct. Printed-key correction: testpointpk keys A 'Difference between total and dynamic pressure'; corrected to C 'Dynamic pressure' (see verification summary).

Question 34 Fluid Mechanics

The equations of motion for a viscous fluid are known as _____?

- A. Hagen-poiseuille equations
- B. Reynolds equation
- C. Navier-Stokes equation ✓ **Correct answer**
- D. None of these

A. Wrong: the Hagen–Poiseuille equation is a particular SOLUTION for laminar flow in a pipe, not the general equations of motion.

B. Wrong: the Reynolds equation governs pressure in a thin lubricating film (and Reynolds number is a separate concept); it is not the general equations of motion.

C. Correct: the Navier–Stokes equations are the general equations of motion for a viscous fluid (Newton's second law applied to fluid flow).

D. Wrong: the Navier-Stokes equation is among the options and is correct.

35 Fluid Mechanics

The Bernoulli’s equation refers to conservation of _____?

- A. Energy ✓ **Correct answer**
- B. Mass
- C. Force
- D. None of these

A. Correct: Bernoulli's equation ($p/\rho g + V^2/2g + z = \text{constant}$) states that the total mechanical energy per unit weight — pressure energy + kinetic energy + potential energy — stays constant along a streamline.

B. Wrong: conservation of mass is the continuity equation, not Bernoulli's equation.

C. Wrong: conservation of force is not a principle; forces are balanced by Newton's second law (the momentum equation).

D. Wrong: energy is among the options and is correct.

Question 36 Mechanical Engineering (Machine Design)

A chain link while in use may be subjected to _____?

- A. Tension
- B. Bending
- C. Shear
- D. Any of the above ✓ **Correct answer**

A. True but partial: a chain link is pulled in tension as it transmits load, but tension is not the only stress it sees.

B. True but partial: the link also bends where it bears on the pins and sprocket teeth, but bending is not the only stress.

C. True but partial: the pins and link ends also carry shear, but shear is not the only stress.

chain link in service is subjected to tension, bending and shear together.

Question 37 General Science (Environmental Engineering)

Which of the following pollutant affects lungs?

- A. Aldine
- B. Silica ✓ **Correct answer**
- C. Benzene
- D. Lead

A. Wrong: "Aldine" is the reproduction's spelling (evidently Aldrin, a pesticide); it is not the classic lung-affecting pollutant of the options.

B. Correct: inhaled silica dust causes silicosis, a serious lung disease of miners and foundry workers — silica is the textbook lung pollutant.

C. Wrong: benzene is a carcinogen that chiefly affects the blood and bone marrow (leukaemia), not the lungs as its classic target.

D. Wrong: lead poisoning chiefly affects the nervous system, kidneys and blood, not the lungs.

Question 38 General Science (Chemistry)

Temporary hardness in water is caused by salts like _____?

- A. Carbonates ✓ **Correct answer**
- B. Sulphates
- C. Nitrates
- D. None of these

A. Correct: temporary hardness is caused by the bicarbonates/carbonates of calcium and magnesium, which precipitate out on boiling — that is why it is "temporary".

B. Wrong: sulphates (and chlorides) of calcium and magnesium cause PERMANENT

C. Wrong: nitrates of calcium and magnesium also cause permanent hardness, not temporary hardness.

D. Wrong: carbonates is among the options and is correct.

Question 39 General Science (Environmental Engineering)

The presence of which of the following material in water is not considered to be dangerous?

- A. Calcium ✓ **Correct answer**
- B. Lead
- C. Copper
- D. None of these

A. Correct: calcium is a normal, harmless mineral in drinking water (it causes hardness, not poisoning) and is even needed by the body.

B. Wrong: lead is a cumulative poison that damages the nervous system and kidneys; it is dangerous in water.

C. Wrong: copper above the safe limit is toxic and causes stomach and liver damage, so it is counted as dangerous in water.

D. Wrong: calcium is among the options and is not dangerous.

Question 40 Mechanical Engineering (Energy)

Geothermal energy is _____?

- A. An inexhaustible energy source
- B. A renewable energy source
- C. An alternative energy source
- D. Any of the above ✓ **Correct answer**

partial: the Earth's internal heat is effectively inexhaustible on human timescales, but that is not the only true description.

B. True but partial: geothermal heat is naturally renewed by the Earth, but that is not the only true description.

C. True but partial: geothermal is an alternative to fossil fuels, but that is not the only true description.

D. Correct: geothermal energy is all three — inexhaustible, renewable and an alternative energy source.

Question 41 Mechanical Engineering (Manufacturing)

The material preferred for the fabrication of fruit juice concentrator is _____?

- A. Copper
- B. Mild steel sheet
- C. Stainless steel sheet ✓ **Correct answer**
- D. None of these

A. Wrong: copper reacts with the acids in fruit juice and can contaminate it, so it is not preferred for food contact.

B. Wrong: mild steel rusts and corrodes in contact with acidic juice, so it is unsuitable.

C. Correct: stainless steel resists the acids in fruit juice, is easy to clean and is food-safe, so it is the preferred material for juice equipment.

D. Wrong: stainless steel sheet is among the options and is correct.

Question 42 Thermodynamics

A perfect black body is the one which _____?

- A. Is coated with lamp black

orbs all incident radiation ✓ Correct answer

- C. Reflects all incident radiation
- D. None of these

A. Wrong: coating a surface with lamp black only APPROXIMATES a black body; a perfect black body is defined by its behaviour, not by a coating.

B. Correct: by definition a perfect black body absorbs all radiation falling on it, reflecting and transmitting none, and it is also a perfect emitter.

C. Wrong: that describes a perfect reflector (a white body), the exact opposite of a black body.

D. Wrong: absorbs all incident radiation is among the options and is correct.

Question 43 Fluid Mechanics

Dynamic similarity is the similarity of _____?

- A. Effective dimensions
- B. Shape
- C. Velocities
- D. None of these

No answer is given for this question, and none is taught. DEFECTIVE-excluded — no option is correct (DEFECTIVE-excluded)

A. Wrong: similarity of dimensions is not dynamic similarity at all.

B. Wrong: similarity of shape is GEOMETRIC similarity, not dynamic similarity.

C. Wrong: similarity of velocities is KINEMATIC similarity, not dynamic similarity (the testpointpk key C is wrong — see verification summary).

D. Wrong as the answer: "None of these" is not the right answer either, because the question asks what dynamic similarity IS, and the correct term (forces) is simply absent

ions; the item is therefore excluded as defective rather than answered. Printed-key correction: testpointpk keys C 'Velocities'; no option is correct — dynamic similarity is the similarity of forces (see verification summary).

Question 44 Thermodynamics

The quantity of heat required to change the temperature of 1 gm of ice from -6°C to -5°C is known as _____?

- A. Cold heat
- B. Latent heat of freezing
- C. Specific heat ✓ **Correct answer**
- D. None of these

A. Wrong: "cold heat" is not a term used in thermodynamics.

B. Wrong: latent heat changes the STATE (ice to water) at constant temperature; here the temperature changes and the ice stays ice.

C. Correct: the heat needed to raise 1 gram of a substance by 1 °C is its specific heat — here, the specific heat of ice (about 2.1 J/g·°C).

D. Wrong: specific heat is among the options and is correct.

Question 45 Thermodynamics

Essential requirement for the transfer of heat from one body to another is _____?

- A. One of the bodies must have internal source of the heat generation
- B. Both bodies must be in contact
- C. Temperature of the two bodies must be different ✓ **Correct answer**
- D. None of these

A. Wrong: heat flows between any two bodies at different temperatures; no internal heat source is needed.

eat can also transfer by radiation across empty space, with no contact at all.

C. Correct: heat always flows from the hotter to the colder body; without a temperature difference there is no heat transfer (this is the zeroth law in action).

D. Wrong: a temperature difference is among the options and is correct.

Question 46 Industrial Engineering

Most of the large scale modern industry using automation, adopt?

- A. Fixed position layout
- B. Process layout
- C. Product layout ✓ **Correct answer**
- D. None of these

A. Wrong: in a fixed-position layout the product stays put and workers come to it (ships, bridges); it is not the layout of automated mass production.

B. Wrong: a process layout groups similar machines together for varied, low-volume jobs; it is not the layout of automated large-scale production.

C. Correct: large-scale automated industry uses a product (line) layout — machines arranged in the sequence of operations, with the product flowing down the line, as in car assembly.

D. Wrong: product layout is among the options and is correct.

Question 47 Mechanical Engineering (Metrology)

Identify the instrument used for surface roughness measurement?

- A. Profilometer ✓ **Correct answer**
- B. Clinometers
- C. Auto-collimator
- D. None of these

profilometer (surface profilometer / Talysurf) traces a stylus over the surface and measures its roughness profile.

B. Wrong: a clinometer measures angles of inclination (slope), not surface roughness.

C. Wrong: an autocollimator measures small angular tilts (straightness, squareness), not surface roughness.

D. Wrong: the profilometer is among the options and is correct.

Question 48 Mechanical Engineering (Metrology)

Identify the measuring instruments that incorporates all the features of try square, bevel protector, ruler and scriber?

- A. Surface plate
- B. V-block
- C. Combination set ✓ **Correct answer**
- D. None of these

A. Wrong: a surface plate is a flat reference surface for marking and measuring; it does not combine a square, protractor, ruler and scriber.

B. Wrong: a V-block holds round work for checking; it has none of these four features.

C. Correct: a combination set has a slotted steel rule carrying interchangeable heads — a square head (try square), a protractor head (bevel protractor) and a centre head — plus a scriber, all in one instrument.

D. Wrong: the combination set is among the options and is correct.

Question 49 Thermodynamics

Steady state heat flow implies _____?

- A. Uniform rate in temperature rise of a body

ligible flow of heat

- C. Constant heat flow rate, i.e. heat flow rate independent of time ✓ **Correct answer**
- D. None of these

A. Wrong: in steady state the temperature at each point does NOT rise at all — it stays constant with time.

B. Wrong: steady state says nothing about the size of the heat flow; it can be large, as long as it is constant.

C. Correct: steady state means the temperatures and the heat flow rate at every point do not change with time.

D. Wrong: constant heat flow rate is among the options and is correct.

Question 50 Fluid Mechanics

The path traced by single particle of smoke issuing from a cigarette is a _____?

- A. Streak line
- B. Flow line
- C. Path line ✓ **Correct answer**
- D. None of these

A. Wrong: a streak line is the line joining all particles that have PASSED through one fixed point (like dye injected continuously); one single particle does not trace a streak line.

B. Wrong: "flow line" is a loose term for a streamline — the line tangent to the velocity at an instant — not the track of one particle over time.

C. Correct: a path line is the actual trajectory traced by one single fluid particle over time — exactly what one smoke particle does.

D. Wrong: path line is among the options and is correct.

51 Thermodynamics

Standard air is the air at _____?

- A. Atmospheric conditions of pressure and temperature at any specific location
- B. 1 bar pressure and 0 degree centigrade temperature
- C. 1 bar pressure and 15 degree centigrade temperature ✓ **Correct answer**
- D. None of these

A. Wrong: local atmospheric conditions vary from place to place; "standard air" is a FIXED reference condition, not whatever the local weather is.

B. Wrong: 0 °C with 1 bar is the IUPAC standard temperature and pressure (STP), not the "standard air" of the textbooks (which uses 15 °C).

C. Correct: the metric standard condition for air is about 1 bar (1.01325 bar) at 15 °C — the standard-air reference used in thermodynamics and aeronautics.

D. Wrong: 1 bar and 15 °C is among the options and is correct.

Question 52 Thermodynamics

Critical pressure for steam is _____?

- A. 163 bar
- B. 252 bar
- C. 225 bar ✓ **Correct answer**
- D. None of these

A. Wrong: 163 bar is well below the critical pressure of water/steam.

B. Wrong: 252 bar is above the critical pressure of steam.

C. Correct: the true critical pressure of water is 221.2 bar (22.06 MPa); 225 bar is the closest option and the intended textbook answer.

D. Wrong: 225 bar is among the options and is correct.

53 Mechanical Engineering (Automobile)

Compared to rear wheel drive, the front wheel drive _____?

- A. Has increased tractive effort when going up steep gradient
- B. Has better riding performance ✓ **Correct answer**
- C. Greater sliding tendency
- D. None of these

A. Wrong: on a steep gradient the vehicle's weight shifts to the rear wheels, unloading the front driving wheels, so a front-wheel drive's tractive effort FALLS on steep gradients — the rear-wheel drive gains the grip there (the testpointpk key A is wrong — see verification summary).

B. Correct: this is the standard MCQ-bank answer for this item — with the engine, gearbox and final drive all at the front and no long propeller shaft, the front-wheel-drive car rides better and has a lower, flatter floor.

C. Wrong: front-wheel drive does not have a greater sliding tendency than rear-wheel drive; its weight over the driving wheels generally gives better road holding on flat and slippery roads.

D. Wrong: better riding performance is among the options and is correct. Printed-key correction: testpointpk keys A 'Has increased tractive effort when going up steep gradient'; corrected to B 'Has better riding performance' (see verification summary).

Question 54 Mechanical Engineering (Manufacturing)

The average frequency of sparks in EDM is _____?

- A. 1000 sparks per second ✓ **Correct answer**
- B. 4000 sparks per second
- C. 2000 sparks per second
- D. None of these

…e textbook "average" quoted for EDM in the MCQ books is about 1,000 sparks per second under normal conditions.

B. Wrong: 4,000 is not the textbook average figure for EDM spark frequency.

C. Wrong: 2,000 is not the textbook average figure either (real machines can spark from about 2,000 up to 500,000 times per second depending on settings, but the intended average among the options is 1,000).

D. Wrong: 1,000 sparks per second is among the options and is correct.

Question 55 Mechanical Engineering (Manufacturing)

Which of the following process is used primarily to obtain surface finish?

- A. Broaching
- B. Hobbing
- C. Honing ✓ **Correct answer**
- D. None of these

A. Wrong: broaching is a metal-removal process for cutting keyways, splines and odd shapes; it is not primarily a finishing process.

B. Wrong: hobbing is a gear-CUTTING process for producing gear teeth, not a surface-finishing process.

C. Correct: honing is an abrasive finishing process used primarily to obtain a fine surface finish and exact size in bores (e.g. engine cylinders).

D. Wrong: honing is among the options and is correct.

Question 56 Mechanical Engineering (Manufacturing)

Which of the following is common between shaper and planner?

- A. Both use single point cutting tool ✓ **Correct answer**

- C. Both have reciprocating work piece
- D. None of these

A. Correct: the shaper and the planer both cut with a single-point tool (like a lathe tool).

B. Wrong: in a shaper the TOOL reciprocates and the work feeds; in a planer the WORK reciprocates and the tool feeds — the tool is not stationary in both.

C. Wrong: only in the planer does the workpiece reciprocate; in the shaper the workpiece is fed slowly and the tool reciprocates.

D. Wrong: both use a single point cutting tool is among the options and is correct.

Question 57 Mechanical Engineering (Manufacturing)

The velocity of the tool relative to work piece is the _____?

- A. Feed
- B. Chip velocity
- C. Cutting velocity ✓ **Correct answer**
- D. None of these

A. Wrong: feed is the relative movement of the tool INTO the work per revolution or per stroke (the advance), not the velocity of the tool relative to the workpiece.

B. Wrong: chip velocity is the speed at which the cut chip flows away over the tool face, not the tool–workpiece relative velocity.

C. Correct: the cutting (cutting speed) is the velocity of the tool relative to the workpiece at the cutting point.

D. Wrong: cutting velocity is among the options and is correct.

Question 58 Mechanical Engineering (Manufacturing)

Loam moulds are used _____?

- A. In centrifugal castings
- B. For small size articles
- C. For large castings ✓ **Correct answer**
- D. None of these

A. Wrong: centrifugal casting uses a spinning metal mould, not a loam mould.

B. Wrong: small articles are cast in ordinary sand moulds; loam moulding is slow and expensive, so it is not used for small work.

C. Correct: loam moulds are built up by hand from loam (clay-sand mixture) on a skeleton, and are used for very large castings (like big bells, cylinders and machine beds) that are too large for a flask.

D. Wrong: for large castings is among the options and is correct.

Question 59 Mechanical Engineering (Manufacturing)

All of the following are squeezing operation except?

- A. Crimping
- B. Stamping ✓ **Correct answer**
- C. Swaging
- D. Trimming

A. Wrong as the exception: crimping squeezes the open end of a shell or can tight around a mating part, so it IS a squeezing operation.

B. Correct as the exception: stamping mainly involves cutting or punching sheet metal in a press, not squeezing it, so it is the odd one out (this is also the GATE forming-processes answer for this item).

the exception: swaging squeezes a tube or rod down in diameter by compressive force, so it IS a squeezing operation.

D. Wrong as the exception: in the MCQ-book classification used here, trimming (squeezing off the excess edge/flash) is counted among the squeezing operations, so it is not the exception.

Question 60 Mechanical Engineering (Manufacturing)

The extrusion chamber, die and the ram are generally lubricated by _____?

- A. Kerosene oil
- B. Grease
- C. Solid lubricant ✓ **Correct answer**
- D. None of these

A. Wrong: kerosene is a thin liquid fuel/solvent; it is not the lubricant used for the extrusion chamber, die and ram (the testpointpk key A is wrong — see verification summary).

B. Wrong: grease cannot survive the pressures and temperatures of extrusion and is not the lubricant used here.

C. Correct: the extrusion chamber, die and ram are lubricated by a solid lubricant (such as graphite or molybdenum disulphide), which stays in place under the high pressure — this is the answer keyed in the virtual-labs extrusion pretest.

D. Wrong: solid lubricant is among the options and is correct. Printed-key correction: testpointpk keys A 'Kerosene oil'; corrected to C 'Solid lubricant' (see verification summary).

Question 61 Mechanical Engineering (Metallurgy)

Cold working of metals is carried out _____?

- ·king temperature depends upon physical conditions of the work piece
- B. Below the recrystallisation temperature ✓ **Correct answer**
- C. At the recrystallisation temperature
- D. None of these

A. Wrong: cold working has a precise definition in terms of the recrystallisation temperature, not a vague dependence on physical conditions.

B. Correct: by definition, cold working is plastic deformation carried out below the metal's recrystallisation temperature (so the grains stay deformed and the metal work-hardens).

C. Wrong: working AT the recrystallisation temperature is the boundary of hot working, not cold working.

D. Wrong: below the recrystallisation temperature is among the options and is correct.

Question 62 Mechanical Engineering (Manufacturing)

The usual methods of shaft manufacturing are _____?

- A. Turning or grinding from rough bars
- B. Hot rolling
- C. Cold drawing
- D. All of the above ✓ **Correct answer**

A. True but partial: shafts are commonly turned or ground to size from rough bars, but that is not the only method.

B. True but partial: shafts are generally made by hot rolling and then finished to size, but that is not the only method.

C. True but partial: shafts are also finished by cold drawing, but that is not the only method.

D. Correct: shafts are made by hot rolling, cold drawing, and turning or grinding from

– all three methods are used.

Question 63 Mechanical Engineering (Machine Design)

A washer is generally specified by its _____?

- A. Thickness
- B. Hole size ✓ **Correct answer**
- C. Outside diameter
- D. None of these

A. Wrong: thickness is a secondary dimension of a washer, not the one it is specified by.

B. Correct: a washer is specified by the size of its hole — that is, the nominal diameter of the bolt it fits (e.g. a "12 mm washer" fits a 12 mm bolt).

C. Wrong: the outside diameter follows from the bolt size; it is not the specifying dimension.

D. Wrong: hole size is among the options and is correct.

Question 64 Mechanical Engineering (Machine Design)

Factor of safety is the ratio of _____?

- A. Yield stress to working stress ✓ **Correct answer**
- B. Breaking stress to working stress
- C. Endurance limit to yield stress
- D. None of these

A. Correct: for ductile materials the factor of safety is the yield stress divided by the working (allowable) stress — the margin against yielding.

B. Wrong: the ratio of ultimate (breaking) stress to working stress is the factor of safety for BRITTLE materials, not the standard definition asked for here.

e endurance limit divided by yield stress is not a factor of safety; it is a material ratio used in fatigue design.

D. Wrong: yield stress to working stress is among the options and is correct.

Question 65 Mechanical Engineering (Manufacturing)

The chisels are generally made of _____?

- A. Dead mild steel
- B. Medium carbon steel
- C. High carbon steel ✓ **Correct answer**
- D. None of these

A. Wrong: dead mild steel is very low-carbon steel; it is too soft to hold a cutting edge.

B. Wrong: medium-carbon steel is used for general parts like axles and gears, not for chisels, which need a harder edge.

C. Correct: chisels are made of high-carbon steel (about 0.75–1.0% carbon) so that the cutting edge can be hardened and will stay sharp.

D. Wrong: high carbon steel is among the options and is correct.

Question 66 Mechanical Engineering (Metallurgy)

The process of carburizing is applied to steel with percentage of carbon content?

- A. 2%
- B. .15% ✓ **Correct answer**
- C. .5%
- D. None of these

A. Wrong: steel with 2% carbon is cast iron territory, not a carburizing steel; carburizing adds carbon, it does not start from 2%.

arburizing (case carburizing) is applied to LOW-carbon steels of about 0.15% carbon, whose surface is then enriched with carbon to about 0.8–1.0% and hardened.

C. Wrong: 0.5% carbon steel is already a medium-carbon steel that can be hardened directly; it is not the steel carburizing is applied to.

D. Wrong: .15% is among the options and is correct.

Question 67 Mechanical Engineering (Manufacturing)

Gears produced by die casting are generally used for _____?

- A. High axial thrust transmission
- B. Light duty ✓ **Correct answer**
- C. Low temperature applications
- D. None of these

A. Wrong: die-cast gears are made of zinc or aluminium alloys and are not strong enough for high thrust loads.

B. Correct: die-cast gears are cheap and fairly accurate but weak, so they are used only for light-duty work (instruments, toys, small appliances).

C. Wrong: low temperature is not what limits die-cast gears; their low STRENGTH is what limits them to light duty.

D. Wrong: light duty is among the options and is correct.

Question 68 Mechanical Engineering (Strength of Materials)

The stress produced by a suddenly applied load as compared to that produced by the same load when applied gradually is _____?

- A. Four-times
- B. Two-times ✓ **Correct answer**
- C. Three-times

A. Wrong: four times is not the factor for a suddenly applied load (it is not even the impact factor for a falling load).

B. Correct: a suddenly applied (but not dropped) load produces twice the stress and twice the extension of the same load applied gradually — the standard result from strain-energy (δ_sudden = 2δ_static).

C. Wrong: three times is not the factor for a suddenly applied load.

D. Wrong: two-times is among the options and is correct.

Question 69 Mechanical Engineering (Theory of Machines)

When a body executes simple harmonic motion, there is always a constant ratio between the displacement of mass and its _____?

- A. Acceleration ✓ **Correct answer**
- B. Frequency
- C. Velocity
- D. None of these

A. Correct: in simple harmonic motion acceleration = $-\omega^2 \times$ displacement, so the ratio of displacement to acceleration is the constant $-1/\omega^2$.

B. Wrong: the frequency is constant for a given system, but the question asks for the quantity that keeps a constant RATIO with displacement — frequency does not vary with displacement at all.

C. Wrong: velocity is greatest at the centre and zero at the extremes, while displacement does the opposite, so their ratio is not constant.

D. Wrong: acceleration is among the options and is correct.

70 General Science (Chemistry)

Bauxite is an ore of _____?

- A. Steel
- B. Iron
- C. Aluminum ✓ **Correct answer**
- D. Copper

A. Wrong: steel is an alloy of iron and carbon, not a metal won from bauxite.

B. Wrong: iron ores are haematite and magnetite; bauxite is not an iron ore.

C. Correct: bauxite (hydrated aluminium oxide) is the chief ore of aluminium, refined by the Bayer process and then smelted.

D. Wrong: copper ores are chalcopyrite and malachite; bauxite is not a copper ore.

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