COMEDK UGET 2026 May 9 Shift 1

Question Paper with Solutions (Memory-Based)

Conducted by Consortium of Medical, Engineering and Dental Colleges of Karnataka)

General Instructions

(i) The test is of 3 hours duration.

(ii) This test paper consists of 180 questions. The maximum marks are 180.

(iii) Physics and Chemistry and Mathematics each contain 60 questions.

(iv) Each question carries +1 marks for correct answer and there is no negative marking for wrong answer.

1. The number of relations, defined on the set {a, b, c, d}, which are both reflexive and symmetric, is equal to:

(A) 256

(B) 16

(C) 1024

(D) 64

Correct Answer: (D) 64

Solution:

Step 1: Understanding the Question:

We need to find the total number of relations on a set with 4 elements that satisfy both the reflexive and symmetric properties.

Step 2: Key Formula or Approach:

For a set containing n elements, the number of relations that are both reflexive and symmetric is given by the formula $2^{\frac{n(n-1)}{2}}$.

Step 3: Detailed Explanation:

Let the set be $A = \{a, b, c, d\}$. The number of elements in the set is $n = 4$.

A relation R on A is a subset of $A \times A$.

For R to be reflexive, it must contain all diagonal elements: $(a, a), (b, b), (c, c), (d, d)$. Since these must be present, we have 1 choice for each (they must be included).

For R to be symmetric, if $(x, y) \in R$, then (y, x) must also be in R.

Excluding the n diagonal elements, there are $n^2 - n$ non-diagonal elements.

These non-diagonal elements form $\frac{n^2-n}{2} = \frac{n(n-1)}{2}$ pairs of the form $\{(x, y), (y, x)\}$.

For the relation to remain symmetric, for each of these pairs, we must either include both elements in R or include neither.

This gives us 2 choices for each of the $\frac{n(n-1)}{2}$ pairs.

Thus, the total number of such relations is $2^{\frac{n(n-1)}{2}}$.

Substitute $n = 4$:

$$\text{Number of relations} = 2^{\frac{4(4-1)}{2}} = 2^{\frac{4\times3}{2}} = 2^6$$

$$2^6 = 64$$

Step 4: Final Answer:

The number of relations that are both reflexive and symmetric is 64.

Quick Tip: Memorize the relation counting formulas for a set of n elements: Total relations $= 2^{n^2}$, Reflexive $= 2^{n^2-n}$, Symmetric $= 2^{\frac{n(n+1)}{2}}$, Both Reflexive and Symmetric $= 2^{\frac{n(n-1)}{2}}$.

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2. How many 4-digit numbers that are divisible by 4 can be formed using the digits 1, 2, 3 and 4 (repetition of digits is not allowed)?

(A) 3

(B) 6

(C) 9

(D) 12

Correct Answer: (B) 6

Solution:

Step 1: Understanding the Question:

We are tasked with forming 4-digit numbers using the digits 1, 2, 3, and 4 without repetition such that the resulting number is divisible by 4.

Step 2: Key Formula or Approach:

A number is divisible by 4 if the number formed by its last two digits is divisible by 4.

Step 3: Detailed Explanation:

We have the digits {1, 2, 3, 4}.

Let's find all possible two-digit combinations (without repetition) from this set that are divisible by 4.

The possible two-digit numbers ending the 4-digit number can be: 12, 24, 32.

(Other combinations like 14, 21, 23, 31, 34, 41, 42, 43 are not divisible by 4).

Now, let's consider each valid case for the last two digits:

Case 1: The number ends in 12.

The remaining digits are {3, 4}. They can be arranged in the first two positions in $2! = 2$ ways (3412, 4312).

Case 2: The number ends in 24.

The remaining digits are {1, 3}. They can be arranged in the first two positions in $2! = 2$ ways (1324, 3124).

Case 3: The number ends in 32.

The remaining digits are {1, 4}. They can be arranged in the first two positions in $2! = 2$ ways (1432, 4132).

Total possible 4-digit numbers $= 2 + 2 + 2 = 6$.

Step 4: Final Answer:

The number of such 4-digit numbers is 6.

Quick Tip: For divisibility by 4 rules, always focus exclusively on the last two digits. Once those are fixed, just permute the remaining digits.

3. The standard deviation of 100 observations is 10. If 20 is added to each observation, then what will be the new standard deviation?

(A) 10

(B) 15

(C) 20

(D) 25

Correct Answer: (A) 10

Solution:

Step 1: Understanding the Question:

We are given the standard deviation of a dataset and asked to find the new standard deviation after a constant value (20) is added to every single observation.

Step 2: Key Formula or Approach:

Standard deviation is a measure of dispersion (spread) around the mean. The property of standard deviation states that if a constant c is added to or subtracted from each observation in a dataset, the standard deviation remains completely unchanged.

Mathematically, if $Y_i = X_i + c$, then $\sigma_Y = \sigma_X$.

Step 3: Detailed Explanation:

Let the original observations be $x_1, x_2, \ldots, x_{100}$.

The original standard deviation is $\sigma_x = 10$.

When 20 is added to each observation, the new observations become $y_i = x_i + 20$.

The mean of the new observations will increase by 20 ($\bar{y} = \bar{x} + 20$).

The deviation of each new observation from the new mean is:

$$y_i - \bar{y} = (x_i + 20) - (\bar{x} + 20) = x_i - \bar{x}$$

Since the deviations from the mean are identical to the original deviations, the variance and the standard deviation remain unaffected.

Therefore, the new standard deviation is still 10.

Step 4: Final Answer:

The new standard deviation will be 10.

Quick Tip: Adding or subtracting a constant shifts the entire distribution but does not change its spread, so variance and standard deviation remain the same. However, multiplying or dividing by a constant k will multiply the standard deviation by $|k|$.

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4. The radius of the base of a cone is increasing at the rate of 3 cm/minute and the altitude is decreasing at the rate of 4 cm / minute. The rate of change of lateral surface when the radius = 7 cm and altitude = 24 cm, is

(A) 54π cm^2/min

(B) 7π cm^2/min

(C) 27π cm^2/min

(D) None of these

Correct Answer: (A) 54π cm^2/min

Solution:

Step 1: Understanding the Question:

We are dealing with related rates. We need to find the rate of change of the lateral surface area of a cone given the rates of change of its radius and altitude.

Step 2: Key Formula or Approach:

The lateral surface area S of a right circular cone is given by:

$$S = \pi r l = \pi r \sqrt{r^2 + h^2}$$

We need to differentiate this equation with respect to time t to find $\frac{dS}{dt}$.

Step 3: Detailed Explanation:

Given values:

$\frac{dr}{dt} = 3$ cm/min (increasing)

$\frac{dh}{dt} = -4$ cm/min (decreasing)

At the given instant: $r = 7$ cm and $h = 24$ cm.

First, let's find the slant height l at this instant:

$$l = \sqrt{r^2 + h^2} = \sqrt{7^2 + 24^2} = \sqrt{49 + 576} = \sqrt{625} = 25 \text{ cm}$$

Now, differentiate $S = \pi r\sqrt{r^2 + h^2}$ with respect to t using the product and chain rules:

$$\frac{dS}{dt} = \pi\left[\frac{dr}{dt} \cdot \sqrt{r^2 + h^2} + r \cdot \frac{d}{dt}\left(\sqrt{r^2 + h^2}\right)\right]$$

$$\frac{dS}{dt} = \pi\left[\frac{dr}{dt} \cdot l + r \cdot \left(\frac{1}{2\sqrt{r^2 + h^2}} \cdot \left(2r\frac{dr}{dt} + 2h\frac{dh}{dt}\right)\right)\right]$$

$$\frac{dS}{dt} = \pi\left[l \cdot \frac{dr}{dt} + \frac{r}{l}\left(r\frac{dr}{dt} + h\frac{dh}{dt}\right)\right]$$

Substitute the known values into the derivative:

$$\frac{dS}{dt} = \pi\left[25(3) + \frac{7}{25}(7(3) + 24(-4))\right]$$

$$\frac{dS}{dt} = \pi\left[75 + \frac{7}{25}(21 - 96)\right]$$

$$\frac{dS}{dt} = \pi\left[75 + \frac{7}{25}(-75)\right]$$

$$\frac{dS}{dt} = \pi[75 + 7(-3)]$$

$$\frac{dS}{dt} = \pi[75 - 21] = 54\pi \text{ cm}^2/\text{min}$$

Step 4: Final Answer:

The rate of change of the lateral surface area is 54π cm^2/min.

Quick Tip: For related rates problems involving roots, it is often less prone to error if you define the intermediate variable (like slant height l) and evaluate its value first before plugging it into the differentiated formula.

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5. The whole area surrounded by the curve with the equations $x = a\cos^3 t, y = b\sin^3 t$ is:

(A) $\frac{3}{4}\pi ab$

(B) $\frac{3}{8}\pi ab$

(C) $\frac{3}{8}\pi a^2 b$

(D) $\frac{3}{8}ab$

Correct Answer: (B) $\frac{3}{8}\pi ab$

Solution:

Step 1: Understanding the Question:

The given parametric equations $x = a\cos^3 t$ and $y = b\sin^3 t$ represent a scaled astroid. Because the curve is symmetric about both the x and y axes, we can calculate the area in the first quadrant (where t varies from 0 to $\pi/2$) and multiply by 4.

Step 2: Key Formula or Approach:

The area A enclosed by a parametric curve is given by:

$$A = 4\int_0^a y\,dx$$

where we evaluate the integral in the first quadrant. Since $x = a\cos^3 t$, as x goes from 0 to a, the parameter t goes from $\pi/2$ to 0. Thus, $dx = -3a\cos^2 t\sin t\,dt$.

Step 3: Detailed Explanation:

Let's set up the integral for the whole area:

$$A = 4\int_{\pi/2}^0 (b\sin^3 t)(-3a\cos^2 t\sin t\,dt)$$

Swapping the limits removes the negative sign:

$$A = 4\int_0^{\pi/2} 3ab\sin^4 t\cos^2 t\,dt = 12ab\int_0^{\pi/2}\sin^4 t\cos^2 t\,dt$$

We can evaluate this using the Wallis formula (or Beta function) for integrals of the form

$\int_0^{\pi/2} \sin^m t \cos^n t \, dt$:

$$\int_0^{\pi/2} \sin^m t \cos^n t \, dt = \frac{[(m-1)(m-3)\ldots1][(n-1)(n-3)\ldots1]}{(m+n)(m+n-2)\ldots2} \times \frac{\pi}{2}$$

Here, $m = 4$ (even) and $n = 2$ (even), so we multiply by $\pi/2$:

$$\int_0^{\pi/2} \sin^4 t \cos^2 t \, dt = \frac{(4-1)(4-3) \times (2-1)}{(4+2)(4+2-2)(4+2-4)} \times \frac{\pi}{2}$$

$$= \frac{(3 \times 1) \times (1)}{6 \times 4 \times 2} \times \frac{\pi}{2} = \frac{3}{48} \times \frac{\pi}{2} = \frac{1}{16} \times \frac{\pi}{2} = \frac{\pi}{32}$$

Now, multiply this back into our area equation:

$$A = 12ab\left(\frac{\pi}{32}\right) = \frac{12}{32}\pi ab = \frac{3}{8}\pi ab$$

Step 4: Final Answer:

The whole area surrounded by the curve is $\frac{3}{8}\pi ab$.

Quick Tip: The Wallis formula is a massive time-saver for definite integrals of sine and cosine products from 0 to $\pi/2$. Remember to multiply by $\pi/2$ only if both powers (m and n) are even integers.

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6. Which of the following is incorrect about charges ?

(A) Static charges are produced by rubbing

(B) An electroscope can detect whether a body is charged or not

(C) Like charges repel each other

(D) A glass rod becomes negative charged when it is rubbed with silk

Correct Answer: (D) A glass rod becomes negative charged when it is rubbed with silk

Solution:

Step 1: Understanding the Question:

We need to identify the logically false statement among the given options regarding the

fundamental properties of electric charges.

Step 2: Detailed Explanation:

Let's evaluate each option:

(A) Static charges are produced by rubbing: This is true. Frictional electricity (triboelectric effect) is generated by rubbing two suitable materials together.

(B) An electroscope can detect whether a body is charged or not: This is true. A gold-leaf electroscope diverges its leaves when brought near or in contact with a charged body.

(C) Like charges repel each other: This is a fundamental law of electrostatics and is entirely true.

(D) A glass rod becomes negative charged when it is rubbed with silk: This statement is mathematically and physically incorrect. When a glass rod is rubbed with silk, electrons are transferred from the glass rod to the silk. Because it loses electrons, the glass rod acquires a **positive** charge, while the silk acquires a negative charge.

Step 3: Final Answer:

The incorrect statement is that a glass rod becomes negatively charged when rubbed with silk.

Quick Tip: The triboelectric series determines which material gains/loses electrons. Classical examples to memorize: Glass rubbed with silk → Glass is (+), Silk is (-). Ebonite/Plastic rubbed with fur/wool → Ebonite is (-), Fur is (+).

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7. The volume of a small ball is calculated to be 25 cm^3 and it weighs 30 g in air. Will this ball float or sink in water?

(A) Sink

(B) Partially sink

(C) Float

(D) Can not be predicted from the given information

Correct Answer: (A) Sink

Solution:

Step 1: Understanding the Question:

To determine whether an object floats or sinks in a fluid, we must compare the density of the object to the density of the fluid.

Step 2: Key Formula or Approach:

Density $(\rho) = \frac{\text{Mass } (m)}{\text{Volume } (V)}$

If $\rho_{\text{object}} > \rho_{\text{fluid}}$, the object will sink.

If $\rho_{\text{object}} < \rho_{\text{fluid}}$, the object will float.

If $\rho_{\text{object}} = \rho_{\text{fluid}}$, it will float suspended within the fluid.

Step 3: Detailed Explanation:

Given values for the ball:

Mass $(m) = 30$ g

Volume $(V) = 25$ cm^3

Calculate the density of the ball:

$$\rho_{\text{ball}} = \frac{30 \text{ g}}{25 \text{ cm}^3} = 1.2 \text{ g/cm}^3$$

The density of water is a standard known value: $\rho_{\text{water}} = 1.0$ g/cm^3.

Comparing the two densities, we see that $1.2 \text{ g/cm}^3 > 1.0 \text{ g/cm}^3$.

Since the density of the ball is greater than that of water, the buoyant force cannot support its weight, and the ball will sink.

Step 4: Final Answer:

The ball will sink.

Quick Tip: Always remember the standard density of water in CGS units is exactly 1 g/cm^3 (or 1000 kg/m^3 in SI units). If mass > volume numerically in CGS, it sinks in water.

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8. A toy car is moving in a straight line at a speed of 6 cm/s and comes to rest after a minute. How far has it traveled?

(A) 600 cm

(B) 60 m

(C) 360 cm

(D) 360 m

Correct Answer: (C) 360 cm

Solution:

Step 1: Understanding the Question:

We are given the speed of a toy car and the duration it travels before stopping. The phrasing "moving at a speed of 6 cm/s and comes to rest after a minute" strongly implies it moves at a uniform speed for one minute and then stops.

Step 2: Key Formula or Approach:

For uniform motion (constant speed):

$$\text{Distance} = \text{Speed} \times \text{Time}$$

Step 3: Detailed Explanation:

Given values:

Speed (v) $= 6$ cm/s

Time (t) $= 1$ minute $= 60$ seconds.

Substitute the values into the distance formula:

$$\text{Distance} = 6 \text{ cm/s} \times 60 \text{ s} = 360 \text{ cm}$$

(Note: If the question meant uniform deceleration from 6 cm/s to 0 cm/s over 60 seconds, the distance would be $\frac{6+0}{2} \times 60 = 180$ cm. Since 180 cm is not among the options, the uniform speed interpretation is uniquely correct).

Step 4: Final Answer:

The toy car has traveled 360 cm.

Quick Tip: Always check units carefully! Conversions like 1 minute = 60 seconds are simple but easily overlooked, leading to wrong answers (like picking 6 cm without converting).

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9. If two thin lenses with focal lengths of +10 cm and +20 cm are placed in contact, what is the total power of the combination?

(A) 10 D

(B) 5 D

(C) 15 D

(D) 30 D

Correct Answer: (C) 15 D

Solution:

Step 1: Understanding the Question:

We need to find the total power of a lens combination when two thin converging (convex) lenses are placed in direct contact.

Step 2: Key Formula or Approach:

The power P of a single lens in Diopters (D) is given by $P = \frac{100}{f}$, where f is the focal length in centimeters.

When thin lenses are placed in contact, their equivalent power is simply the algebraic sum of their individual powers:

$$P_{\text{total}} = P_1 + P_2$$

Step 3: Detailed Explanation:

First, calculate the power of the first lens ($f_1 = +10$ cm):

$$P_1 = \frac{100}{10} = +10 \text{ D}$$

Next, calculate the power of the second lens ($f_2 = +20$ cm):

$$P_2 = \frac{100}{20} = +5 \text{ D}$$

Now, find the total power of the combination:

$$P_{\text{total}} = P_1 + P_2 = 10 \text{ D} + 5 \text{ D} = 15 \text{ D}$$

Step 4: Final Answer:

The total power of the combination is 15 D.

Quick Tip: Remember to always convert focal lengths to meters (or use the $100/f$ formula for cm) before calculating Power. Power is additive only for thin lenses in contact.

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10. The magnetic field around a current-carrying solenoid is similar to the magnetic field of a:

(A) Compass needle

(B) Permanent magnet

(C) Electromagnet

(D) Bar magnet

Correct Answer: (D) Bar magnet

Solution:

Step 1: Understanding the Question:

The question asks to identify which common magnetic object produces a magnetic field pattern identically shaped to that of a current-carrying solenoid.

Step 2: Detailed Explanation:

A solenoid is a long coil of wire wrapped in many turns. When a direct current passes through it, it produces a magnetic field.

Inside the solenoid, the magnetic field lines are parallel, straight, and densely packed, indicating a strong, uniform magnetic field.

Outside the solenoid, the field lines curve around from one end to the other, emerging from one end (which acts as the North pole) and entering the other end (which acts as the South pole).

This specific spatial distribution of the magnetic field lines is geometrically indistinguishable

from the magnetic field produced by a standard cylindrical or rectangular **bar magnet**.

Step 3: Final Answer:

The magnetic field around a current-carrying solenoid is similar to that of a bar magnet.

Quick Tip: While a solenoid *is* an electromagnet, the phrasing "similar to the magnetic field of" seeks the classic geometric equivalent, which is universally taught as the bar magnet in electromagnetism.

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11. Which of the following is not a property of a thermodynamic system?

(A) Internal energy

(B) Heat

(C) Pressure

(D) Temperature

Correct Answer: (B) Heat

Solution:

Step 1: Understanding the Question:

We must distinguish between thermodynamic properties (state functions) and path functions. A thermodynamic property describes the state of a system regardless of how it arrived at that state.

Step 2: Detailed Explanation:

Let's analyze the options:

(A) Internal Energy (U): This is a state function. It depends only on the current state of the system (like Temperature and Volume) and is a definitive property.

(C) Pressure (P): This is a macroscopic state variable and clearly a property of the system.

(D) Temperature (T): This is also a fundamental state variable representing thermal equilibrium and is a property of the system.

(B) Heat (q): Heat is defined as energy in transit due to a temperature difference. It is a path function, meaning the amount of heat transferred depends heavily on the specific process (path) taken to go from an initial to a final state. A system does not "contain" heat; it contains

internal energy. Therefore, heat is not a property of the system itself.

Step 3: Final Answer:

Heat is not a property of a thermodynamic system.

Quick Tip: State functions (Properties) = Pressure, Volume, Temperature, Internal Energy, Enthalpy, Entropy. Path functions (Not properties) = Heat and Work.

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12. Which of the following has zero dipole moment ?

(A) NH_3

(B) NF_3

(C) BF_3

(D) None of these

Correct Answer: (C) BF_3

Solution:

Step 1: Understanding the Question:

A molecule has a zero dipole moment if its individual bond dipoles perfectly cancel each other out. This happens in highly symmetric molecular geometries without lone pairs on the central atom (or highly specific symmetric lone pair arrangements).

Step 2: Detailed Explanation:

Let's evaluate the structure of each molecule:

(A) NH_3 (Ammonia): The Nitrogen atom is sp^3 hybridized and possesses one lone pair. The geometry is trigonal pyramidal. The individual N-H bond dipoles add up, and the lone pair also contributes, resulting in a net non-zero dipole moment (≈ 1.47 D).

(B) NF_3 (Nitrogen trifluoride): Similar to ammonia, it has a trigonal pyramidal shape due to the lone pair on Nitrogen. The N-F bond dipoles oppose the lone pair dipole, leading to a small but strictly non-zero net dipole moment (≈ 0.24 D).

(C) BF_3 (Boron trifluoride): The Boron atom is sp^2 hybridized and has no lone pairs. The

molecule adopts a perfect trigonal planar geometry with bond angles of exactly 120°. Due to this perfect symmetry, the three B-F bond dipoles pull equally in opposite directions, entirely canceling each other out via vector addition. Thus, the net dipole moment is absolutely zero.

Step 3: Final Answer:

BF_3 has a zero dipole moment.

Quick Tip: Central atoms with no lone pairs surrounded by identical atoms (e.g., linear, trigonal planar, tetrahedral, octahedral geometries) will inherently have a zero dipole moment due to symmetric vector cancellation.

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13. How many degrees of freedom are there at the triple point in a one-component system?

(A) 0

(B) 1

(C) 2

(D) 3

Correct Answer: (A) 0

Solution:

Step 1: Understanding the Question:

We need to calculate the degrees of freedom for a one-component system existing exactly at its triple point using Gibbs Phase Rule.

Step 2: Key Formula or Approach:

Gibbs Phase Rule relates the degrees of freedom (F), the number of components (C), and the number of phases in equilibrium (P) mathematically:

$$F = C - P + 2$$

Step 3: Detailed Explanation:

From the problem description:

The system is a "one-component system", therefore $C = 1$ (e.g., pure water).
The system is at its "triple point". By definition, a triple point is the unique temperature and pressure where three phases (solid, liquid, and gas) coexist in mutual thermodynamic equilibrium. Therefore, the number of phases $P = 3$.
Substitute these values into the Phase Rule:

$$F = 1 - 3 + 2$$

$$F = 0$$

A degree of freedom of 0 means the system is "invariant". Neither pressure nor temperature can be changed without disrupting the equilibrium and losing at least one of the three phases.

Step 4: Final Answer:

There are 0 degrees of freedom at the triple point.

Quick Tip: The triple point of any pure substance is invariant ($F = 0$). It occurs strictly at one specific, unalterable temperature and pressure uniquely characteristic of that substance.

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14. Which of the following gives a Silver mirror test positively with Tollen's reagent?

(A) CH_3CH_2OH
(B) CH_3CHO
(C) CH_3COOH
(D) $CH_3CH_2OCH_2CH_3$

Correct Answer: (B) CH_3CHO

Solution:

Step 1: Understanding the Question:

The Silver mirror test (Tollen's test) is a specific chemical laboratory test used to distinguish between aldehydes and ketones. It requires identifying the aldehyde among the given options.

Step 2: Detailed Explanation:

Tollen's reagent is an ammoniacal silver nitrate solution, $[Ag(NH_3)_2]^+$. It acts as a mild oxidizing agent.

- Aldehydes are readily oxidized to their corresponding carboxylic acids by Tollen's reagent. During this process, the Ag^+ ion is reduced to metallic silver (Ag), which deposits on the inner wall of the test tube, forming a shiny "silver mirror".

- Ketones, alcohols, ethers, and carboxylic acids generally resist oxidation by such a mild reagent and thus do not yield a positive test.

Let's look at the options:

(A) CH_3CH_2OH is Ethanol (a primary alcohol) - Negative.

(B) CH_3CHO is Acetaldehyde (an aldehyde) - **Positive**.

(C) CH_3COOH is Acetic acid (a carboxylic acid) - Negative.

(D) $CH_3CH_2OCH_2CH_3$ is Diethyl ether (an ether) - Negative.

Therefore, acetaldehyde is the only compound that will form the silver mirror.

Step 3: Final Answer:

CH_3CHO gives a positive silver mirror test.

Quick Tip: Tollen's test and Fehling's test are the standard definitive reactions strictly identifying the presence of an aldehyde functional group ($-CHO$) over a ketone.

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15. The maximum energy of photoelectron depends on _____.

(A) Threshold frequency of the metal

(B) Photoelectric work function of the metal

(C) Wavelength of the incident radiation

(D) All of these

Correct Answer: (D) All of these

Solution:

Step 1: Understanding the Question:

The question asks for the factors that dictate the maximum kinetic energy of electrons emitted during the photoelectric effect.

Step 2: Key Formula or Approach:

Albert Einstein's photoelectric equation mathematically relates these parameters:

$$K_{max} = h\nu - \Phi$$

Where: K_{max} = Maximum kinetic energy of the photoelectron $h\nu$ = Energy of the incident photon (which relates to its wavelength λ since $\nu = c/\lambda$) Φ = Work function of the metal (which relates to threshold frequency ν_0 since $\Phi = h\nu_0$)

Step 3: Detailed Explanation:

By substituting the alternative forms into Einstein's equation, we can write it in a few equivalent ways: 1. $K_{max} = \frac{hc}{\lambda} - \Phi$ 2. $K_{max} = h\nu - h\nu_0$ From these equations, we can clearly see that K_{max} depends heavily on: - The wavelength (λ) or frequency (ν) of the incident radiation. - The work function (Φ) of the specific metal surface. - The threshold frequency (ν_0), which is directly proportional to the work function. Since Options (A), (B), and (C) all represent parameters present in the fundamental equation determining K_{max}, the maximum energy inherently depends on all of them.

Step 4: Final Answer:

The maximum energy of the photoelectron depends on all of the listed factors.

Quick Tip: Kinetic energy of photoelectrons depends entirely on the *color/wavelength/frequency* of the light and the *material* of the target. It does completely NOT depend on the *intensity* (brightness) of the light.