

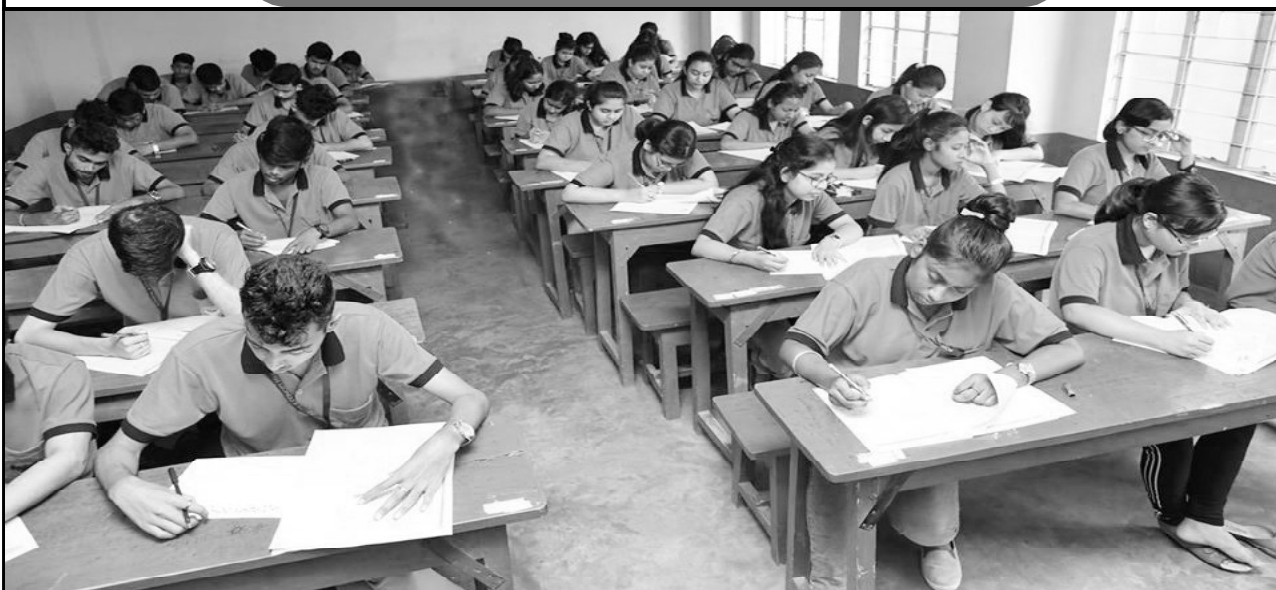
Academic Session : 2019 - 20

ANTS FULL TEST (TEST CODE) : FT # 28
(JEE-MAIN PATTERN)

Target : JEE-MAIN - 2020

Date : 09th August, 2020 | Duration : 3 Hours | Max. Marks : 300

COURSE : Dropper, Target, DLP., ANTS



Please read the last page of this booklet for the instructions.

Potential & Concept Educations

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Note : For Answer keys and accurate Solutions please log on to
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PHYSICS

1. Suppose the average mass of rain drops is 3.0×10^{-5} kg and their average terminal velocity 9m/s. Calculate the energy transferred by rain to each square metre of the surface at a place which receives 100 cm of rain in a year. (Single option correct)

a 4.05×10^4 J

b 3.05×10^4 J

c 2.05×10^4 J

d 4.01×10^4 J

2. A bullet of mass 2 g is having a charge of $2 \mu\text{C}$. The potential difference it must be accelerated through, starting from rest, to acquire a speed of 10 m/s is

(Single option correct)

a 5 kV

b 50 kV

c 5 v

d 50 v

3. A coil having N turns is wound tightly in the form of a spiral with inner and outer radii a and b respectively. When a current I passes through the coil, the magnetic field at the centre is (Single option correct)

a $\frac{\mu_0 NI}{b}$

b $\frac{2\mu_0 NI}{a}$

c $\frac{\mu_0 NI}{2(b-a)} \log \frac{b}{a}$

d $\frac{\mu_0 NI}{2(b-a)} \log \frac{a}{b}$

4. A body of mass $\sqrt{3}$ kg is suspended by a string from a rigid support. The body is pulled horizontally by a force F until the string makes an angle of 30° with the vertical. The value of F and tension in the string are (Single option correct)

a 19.6 N; 19.6 N

b 9.8 N; 9.8 N

c 9.8 N; 19.6 N

d 19.6 N; 9.8 N

5. The focal length of a mirror is given by $\frac{2}{f} = \frac{1}{v} - \frac{1}{u}$. If in the measurement of u and v, the errors are equal to p each, then the relative error in f is (Single option correct)

a $\frac{p}{2} \left(\frac{1}{u} + \frac{1}{v} \right)$

b $p \left(\frac{1}{u} + \frac{1}{v} \right)$

c $\frac{p}{2} \left(\frac{1}{u} - \frac{1}{v} \right)$

d $p \left(\frac{1}{u} - \frac{1}{v} \right)$

6. For a planet, the graph of T^2 against r^3 is plotted. The slope of the graph is (Single option correct)

a $4\pi GM$

b $\frac{4\pi^2}{GM}$

c $\frac{GM}{4\pi^2}$

d $\frac{GM}{4\pi}$

7. Assertion: The phase difference between any two points on a wave front is zero.

Reason: Light from the source reaches every point of the wave front at the same time. (Single option correct)

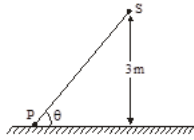
a If both Assertion and Reason are true and the Reason is correct explanation of the Assertion.

b If both Assertion and Reason are true but Reason is not explanation of the Assertion.

c If Assertion is true but the Reason is false.

d If Assertion is false but Reason is true.

8. Spotlight **S** rotates in a horizontal plane with a constant angular velocity of 0.1 rad s^{-1} . The spot of light **P** moves along the wall at a distance of 3 m . The velocity of the spot **P** when $\theta = 45^\circ$ (see. fig.) is



(Single option correct)

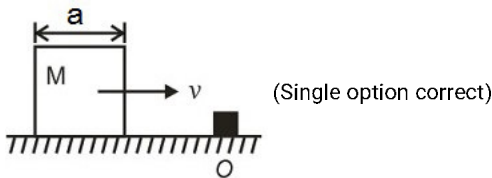
9. Two moles a monatomic gas in state 'A' having critical pressure P_0 and temperature $3T_0$ is taken to a state B having pressure $3P_0$ and temperature $T_0/3$ by the process of equation $P^2T = \text{constant}$. Then state B is taken to state C keeping the volume constant and it comes back to initial state 'A' keeping temperature constant. Heat supplied to the gas during the complete cycle. (Single option correct)

- a $RT_0(10 \ln 3 + 8)$ b $RT_0(18 \ln 3 + 8)$
 c $RT_0(15 \ln 4 + 8)$ d $RT_0(12 \ln 4 + 8)$

10. The ratio of wavelengths of proton and deuteron accelerated through the same potential difference will be (Single option correct)

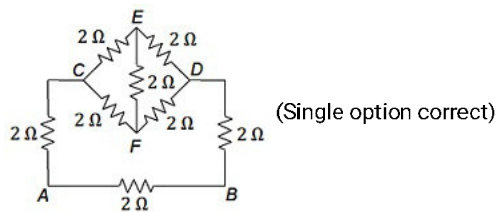
- a $1 : 2$ b $2 : 1$
 c $\sqrt{2} : 1$ d $1 : \sqrt{2}$

11. A cubical block of side moving with a velocity v on a horizontal smooth plane as shown. It hits a ridge at point **O** and sticks to it (collision is perfectly inelastic). The angular speed of the block after it hits **O** is



- a $\frac{3v}{4a}$ b $\frac{3v}{2a}$
 c $\frac{\sqrt{3}v}{\sqrt{2}a}$ d Zero

18 The resistance of the following circuit figure between **A** and **B** is



a $\frac{3}{2} \Omega$

b 2Ω

c 4Ω

d 8Ω

19 Two waves are described by the equations:

$$y_1 = A \cos(0.5 \pi x - 100 \pi t)$$

$$\text{And } y_2 = A \cos(0.46 \pi x - 92 \pi t)$$

Here x and y are in m and t is in s .

The number of maximum heard in one second will be (Single option correct)

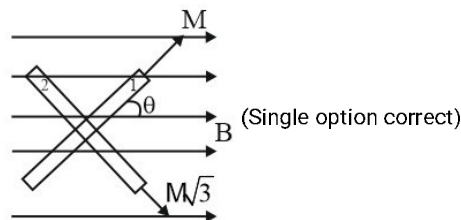
a 4

b 3

c 2

d 1

20 Two short bar magnets of dipole moments M and $M\sqrt{3}$ are joined at right angles to form a cross as depicted in the figure. The value of θ for which the system remains in equilibrium in a uniform external magnetic field B , is



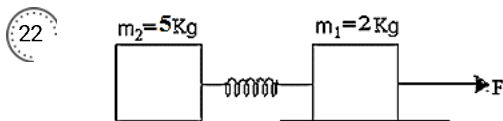
a $\theta = 30^\circ$

b $\theta = 45^\circ$

c $\theta = 60^\circ$

d $\theta = 15^\circ$

21 At what distance (in m) from a convex mirror of focal length $2.5 m$ should a boy stand so that his image has a height equal to half of his height? The principal axis of the mirror is perpendicular to the height of the boy. (Subjective Numerical)



In the figure shown initially the spring is in its original length. Find the minimum value of F required to move m_2 . The coefficient of friction between m_1, m_2 and ground is 0.17 (Take $g = 10 ms^{-2}$) (Subjective Numerical)

23 A body of mass $3 kg$ collides elastically with another body at rest and then continues to move in the original direction with one-half of its original speed. What is the mass of the target body (in kg)? (Subjective Numerical)

24. The peak emission from a body at a certain temperature occurs at a wavelength of 9000 \AA . On increasing its temperature the total radiation emitted is increased to 81 times. At the initial temperature when the peak radiation from the black body is incident on a metal surface it does not cause any photoemission from the surface. After the increase of temperature the peak radiation from the black body causes photoemission. To bring these photoelectrons to rest, potential equivalent to the excitation energy between the $n = 2$ to $n = 3$ Bohr levels of hydrogen atom is required. Find the work function of the metal. (in eV)
[$h = 6.62 \times 10^{-34} \text{ J-s}$ and $c = 3 \times 10^8 \text{ m/s}$] (Subjective Numerical)

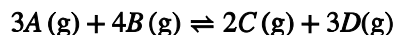
25. A thin rod of negligible mass and area of cross-section $4 \times 10^{-6} \text{ m}^2$, suspended vertically from one end, has a length of 0.5 m at $100 \text{ }^\circ\text{C}$. The rod is cooled to $0 \text{ }^\circ\text{C}$ but prevented from contracting by attaching a mass at the lower end. The value of this mass is
(Given, coefficient of linear expansion is $10^{-5} \text{ }^\circ\text{C}^{-1}$, Young's modulus is $Y = 10^{11} \text{ N m}^{-2}$ and $g = 10 \text{ m s}^{-2}$)
(Subjective Numerical)

CHEMISTRY

1. The type of isomerism shown by nitro methane is (Single option correct)

- | | |
|-------------------|----------------------|
| a Chain isomerism | b Position isomerism |
| c metamerism | d tautomerism |

2. 3 moles of **A** and 4 moles of **B** are mixed together and allowed to come into equilibrium according to the following reaction.



When equilibrium is reached, there is 1 mole of **C**.

The equilibrium extent of the reaction is (Single option correct)

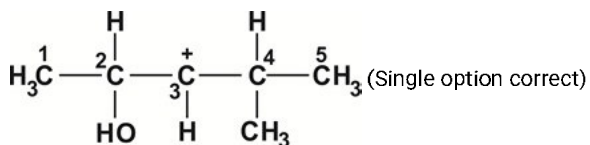
- | | |
|-----------------|-----------------|
| a $\frac{1}{4}$ | b $\frac{1}{3}$ |
| c $\frac{1}{2}$ | d 1 |

3. For the indicator, HIn; the ratio $\frac{[In^-]}{[HIn]}$ is 7.0 at pH of 4.3. K_{in} for the indicator is

[Given: $\log 7 = 0.845$ and $\text{Antilog}(-3.455) = 3.5 \times 10^{-4}$] (Single option correct)

- | | |
|------------------------|------------------------|
| a 3.5×10^{-4} | b 3.5×10^{-5} |
| c 3.5×10^{-2} | d 3.5×10^{-3} |

4. In the following carbocation, **H/CH₃** that is most likely to migrate to the positively charged carbon is



- | | |
|---|------------------------------------|
| a CH₃ at C - 4 | b H at C - 4 |
| c CH₃ at C₂ | d H at C₂ |

5. Chromium is obtained by reducing purified chromite ore with (Single option correct)

- | | |
|--------------------|--------------------|
| a Red hot coke | b Gaseous hydrogen |
| c Aluminium powder | d Carbon monoxide |

6. The lattice energy of solid NaCl is 180 kcal/mol. The dissolution of the solid in water in the form of ions is endothermic to the extent of 1 kcal/mol. If the hydration energies of Na⁺ and Cl⁻ are in the ratio 6 : 5, what is the enthalpy of hydration of Na⁺ ion ? (Single option correct)

- | | |
|--------------------------------|---------------------------------|
| a -8.5 kcal mol ⁻¹ | b -97.64 kcal mol ⁻¹ |
| c +82.6 kcal mol ⁻¹ | d +100 kcal mol ⁻¹ |

7. A proton captures a free electron whose K.E. is zero & forms a hydrogen atom of lowest energy-level ($n = 1$). If a photon is emitted in this process, what will be the wavelength of radiation. In which region of electromagnetic spectrum, will this radiation fall.
 (Ionization potential of hydrogen = 13.6 volt, $h = 6.6 \times 10^{-34}$ K/s, $c = 3.0 \times 10^8$ m/s) (Single option correct)

a 912 Å

b 520 Å

c 350 Å

d 560 Å

8. In a first order reaction the concentration of reactant decreases from 800 mol/dm^3 to 50 mol/dm^3 in 200 sec. The rate constant of reaction in s^{-1} is (Single option correct)

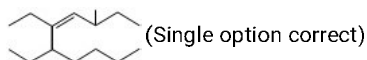
a $2 \times 10^{-4} \text{ s}^{-1}$

b $1.386 \times 10^{-2} \text{ s}^{-1}$

c $3.45 \times 10^5 \text{ s}^{-1}$

d $2 \times 10^4 \text{ s}^{-1}$

9. The IUPAC name of the given compound



a 5,6-Diethyl-3-methyl-4-decene

b 7-Methyl-2,4,6-triene octanal

c 6-Methyl heptene

d 3,3-Diethyl-5-ethyl-4-decene

10. One molal solution of a carboxylic acid in benzene shows the elevation in boiling point of 1.518 K. The degree of association for dimerisation of the acid in benzene is (K_b for benzene = $2.53 \text{ K kg mol}^{-1}$) (Single option correct)

a 60%

b 70%

c 75%

d 80%

11. On treatment of 100 ml of 0.1 M solution of the complex $\text{CrCl}_3 \cdot 6\text{H}_2\text{O}$ with excess of AgNO_3 , 4.305 g of AgCl was obtained. The complex is (Single option correct)

a $[\text{Cr}(\text{H}_2\text{O})_3 \text{Cl}_3] \cdot 3\text{H}_2\text{O}$

b $[\text{Cr}(\text{H}_2\text{O})_4 \text{Cl}_2] \text{Cl} \cdot 2\text{H}_2\text{O}$

c $[\text{Cr}(\text{H}_2\text{O})_5 \text{Cl}] \text{Cl}_2 \cdot \text{H}_2\text{O}$

d $[\text{Cr}(\text{H}_2\text{O})_6] \text{Cl}_3$

12. Product is (Single option correct)

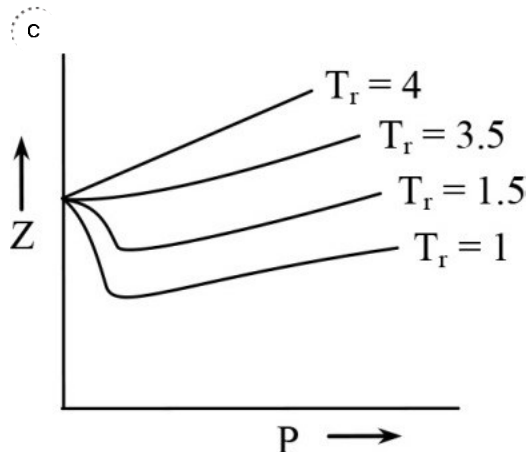
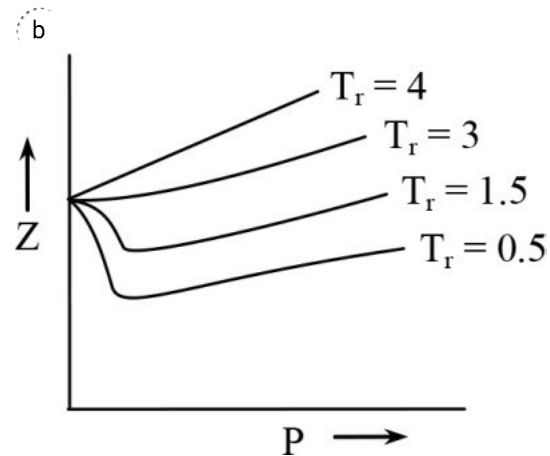
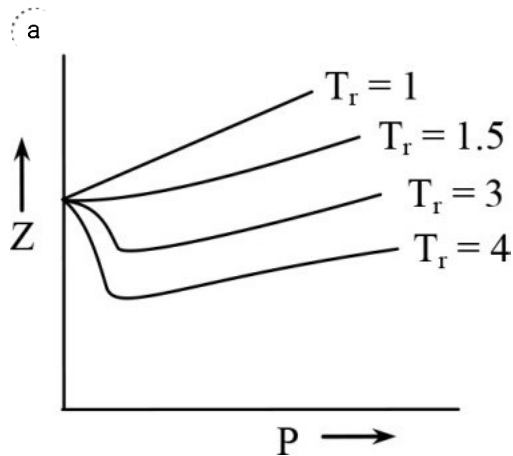
a

b

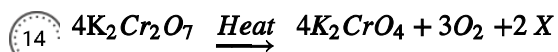
c Mixture of and

d

13 Which of the following plots is/are correct? T_r is reduced temperature - (Single option correct)



d All of the given are correct



In the above reaction, X is: (Single option correct)

a CrO_3

b Cr_2O_7

c Cr_2O_3

d CrO_5

15 The basis for the classification of elements in the modern periodic table is (Single option correct)

a Atomic Number

b Atomic weight

c Atomic volume

d Equivalent weight

16 In which of the following arrangements, the sequence is not strictly according to the property written against it? (Single option correct)

a $CO_2 < SiO_2 < SnO_2 < PbO_2$: increasing oxidising power

b $HF < HCl < HBr < HI$: increasing acid strength

c $B < C < O < N$: increasing first ionisation energy

d $NH_3 < PH_3 < AsH_3 < SbH_3$: increasing basic strength

17 An element crystallizes as body centred cubic lattice. Its density is 7.12 g cm^{-3} and the length of the side of the unit cell is 2.88 \AA . Calculate the number of atoms present in 288 g of the element. (Single option correct)

a 3.386×10^{24}

b 2.356×10^{24}

c 1.232×10^{24}

d 2.248×10^{24}

18. ${}_{90}\text{Th}^{228}$ emits four alpha and one beta particle. Number of neutrons in daughter element is (Single option correct)

a 129

b 190

c 232

d 138

19. Mark the gas which turns lime water milky (Single option correct)

a H_2S

b NO_2

c Cl_2

d CO_2

20. How many g of 'S' is required to produce 10g of H_2SO_4 ? (Single option correct)

a 3.265 g S

b 2.65 g S

c 32.65 g S

d 326.5 g S

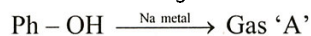
21. An equal volume of a reducing agent is titrated separately with 1 M KMnO_4 in acid, neutral and alkaline medium. The volumes of KMnO_4 required are 20 mL in acid, 33.3 mL in neutral and 100 mL in alkaline media. Find out the oxidation state of manganese in each reduction product. Give the balanced equations for all the three half reaction. Find out the volume of 1M $\text{K}_2\text{Cr}_2\text{O}_7$ consumed, if the same volume of the reducing agent is titrated in acid medium. (Subjective Numerical)

22. How many of the following nitrates of metal 'M' decompose on heating similar to as given below in the scheme?

(where; $\mathbf{M} = \text{Li, Be, Mg, K, Ca, Sr, Na, Rb, Ba}$) Metal nitrate $\xrightarrow{\text{Heat}}$ metal oxide + nitrogen dioxide + oxygen gas (Subjective Numerical)

23. Depict the galvanic cell in which the reaction, $\text{Zn (s)} + 2\text{Ag}^+ (\text{aq}) \longrightarrow \text{Zn}^{2+} (\text{aq}) + 2\text{Ag (s)}$ takes place. Report the value of E_{cell}° (Subjective Numerical)

24. Consider following reactions:



The sum of molecular masses of gas **A** and **B** is _____ **u**. (Subjective Numerical)

25. Number of oxygen atoms shared per SiO_4^{4-} tetrahedron in single chain silicates are _____. (Subjective Numerical)

MATHEMATICS

1. $\lim_{x \rightarrow 0} \frac{x + \ln(\sqrt{1+x^2} - x)}{x^3} =$ (Single option correct)

a $\frac{1}{6}$

b $\frac{1}{7}$

c $-\frac{1}{8}$

d $-\frac{1}{6}$

2. The solution of the equation $[\sin x + \cos x]^{1+\sin 2x} = 2, -\pi \leq x \leq \pi$ is (Single option correct)

a $\frac{\pi}{2}$

b π

c $\frac{\pi}{4}$

d $\frac{3\pi}{4}$

3. A survey shows that 63% of the Americans like cheese whereas 76% like apples. If $x\%$ of the Americans like both cheese and apples, then (Single option correct)

a $x = 39$

b $x = 63$

c $39 \leq x \leq 63$

d None of these

4. From a 60 meter high tower angles of depression of the top and bottom of a house are α and β respectively. If the height of the house is $\frac{60 \sin(\beta - \alpha)}{x}$, then $x =$ (Single option correct)

a $\sin \alpha \sin \beta$

b $\cos \alpha \cos \beta$

c $\sin \alpha \cos \beta$

d $\cos \alpha \sin \beta$

5. In how many ways can 5 identical black balls, 7 identical red balls and 6 identical green balls be arranged in a row so that at least one ball is separated from balls of the same colour? (Single option correct)

a $\frac{15!}{5!6!7!} - 6$

b $\frac{18!}{5!7!6!} - 6$

c $\frac{15!}{7!6!7!} - 6$

d $\frac{15!}{5!6!7!} - 5$

6. For real x , the function $\frac{(x-a)(x-b)}{(x-c)}$ will assume all real values provided (Single option correct)

a $a > b > c$

b $a < b < c$

c $a > c > b$

d $a \leq c \leq b$

7. The system of equations $x + 2y + 3z = 1$, $2x + y + 3z = 2$ and $5x + 5y + 9z = 5$ has (Single option correct)

a Unique solution

b Infinite many solution

c Inconsistent

d None of the above

8. If p is a prime number, then $n^p - n$ is divisible by p when n is a (Single option correct)

a Natural number greater than 1

b Irrational number

c Complex number

d Odd number

9. An experiment yields 3 mutually exclusive and exhaustive events A, B and C . If $P(A) = 2P(B) = 3P(C)$, then $P(A)$ is equal to (Single option correct)

a $\frac{1}{11}$

b $\frac{2}{11}$

c $\frac{3}{11}$

d $\frac{6}{11}$

10. If the area above the x -axis, bounded by the curves $y = 2^{kx}$, and $x = 0$ and $x = 2$ is $\frac{3}{\log 2}$, then the value of k is - (Single option correct)

a $\frac{1}{2}$

b 1

c -1

d 2

11. If P represents $z = x + iy$ in the argand plane $|z - 1|^2 + |z + 1|^2 = 4$ then locus of P is (where $i = \sqrt{-1}$) (Single option correct)

a $x^2 + y^2 = 2$

b $x^2 + y^2 = 1$

c $x^2 + y^2 = 4$

d $x + y = 2$

12. The solution of $\frac{dy}{dx} + \sqrt{\frac{1-y^2}{1-x^2}} = 0$ is { Where C is an arbitrary constant }

(Single option correct)

a $\tan^{-1} x + \cot^{-1} x = c$

b $\sin^{-1} x + \sin^{-1} y = c$

c $\sec^{-1} x + \operatorname{cosec}^{-1} x = c$

d None of these

13. If the radius of the circum-circle of an isosceles ΔABC is equal to $AB (= AC)$, then $\angle A$ is- (Single option correct)

a $\frac{\pi}{4}$

b $\frac{2\pi}{3}$

c $\frac{\pi}{3}$

d $\frac{\pi}{2}$

14. If a, b, c, d and p are distinct real number such that $(a^2 + b^2 + c^2)p^2 - 2(ab + bc + cd)p + (b^2 + c^2 + d^2) \leq 0$, then a, b, c, d (Single option correct)

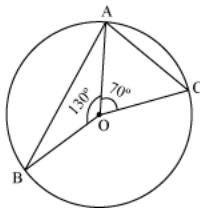
a are in AP

b are in GP

c are in HP

d satisfy $ab = cd$

15. In the given figure, a circle with centre O is shown.



What is the measure of $\angle BAC$? (Single option correct)

a 60

b 80

c 120

d 160

16. The vertices of a triangle are $A(x_1, x_1 \tan \alpha)$, $B(x_2, x_2 \tan \beta)$ and $C(x_3, x_3 \tan \gamma)$. If the circumcentre of $\triangle ABC$ coincides with the origin and $H(a, b)$ be its orthocentre, then $\frac{a}{b}$ is equal to: (Here α, β and γ are acute angles) (Single option correct)

a $\frac{\cos \alpha + \cos \beta + \cos \gamma}{\cos \alpha \cos \beta \cos \gamma}$

b $\frac{\sin \alpha + \sin \beta + \sin \gamma}{\sin \alpha \sin \beta \sin \gamma}$

c $\frac{\tan \alpha + \tan \beta + \tan \gamma}{\tan \alpha \tan \beta \tan \gamma}$

d $\frac{\cos \alpha + \cos \beta + \cos \gamma}{\sin \alpha + \sin \beta + \sin \gamma}$

17. If $y = \sec(\tan^{-1} x)$, then $\frac{dy}{dx}$ is equal to: (Single option correct)

a $\frac{x}{\sqrt{1+x^2}}$

b $-\frac{x}{\sqrt{1+x^2}}$

c $\frac{x}{\sqrt{1-x^2}}$

d None of these

18. If $y = \cos^{-1}(\cos 10)$, then y is equal to (Single option correct)

a 10

b $4\pi - 10$

c $2\pi + 10$

d $2\pi - 10$

19. $\int_0^{\frac{\pi}{2}} \frac{\sin x - \cos x}{1 + \sin x \cdot \cos x} dx$ is equal to (Single option correct)

a 0

b $\frac{\pi}{4}$

c $\frac{\pi}{2}$

d π

20. $\int \frac{(x^3 + 3x^2 + 3x + 1)}{(x+1)^5} dx$ is equal to (Single option correct)

a $-\frac{1}{(x+1)} + c$

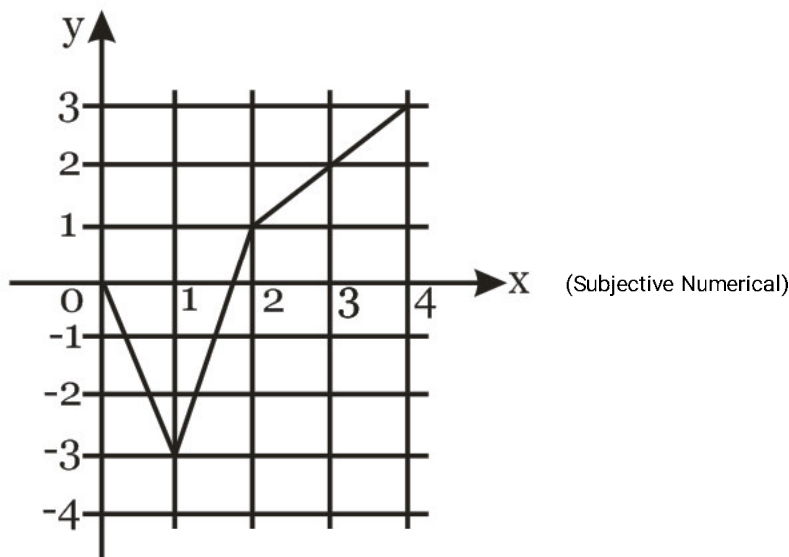
b $\frac{1}{5} \log(x+1) + c$

c $\log(x+1) + c$

d $\tan^{-1} x + c$

21. Given is a partial graph of an even periodic function f whose period is 8. If $[*]$ denotes greatest integer function then find the value of the expression.

$$f(-3) + 2|f(-1)| + \left[f\left(\frac{7}{8}\right) \right] + f(0) + \cos^{-1}(f(-2)) + f(-7) + f(20)$$



22 Let $f(x+y) = f(x)f(y)$ for all x and y . If $f(0) = 1$, $f(3) = 3$ and $f'(0) = 11$, then the value $f'(3)$ _____
(Subjective Numerical)

23 In the expansion $\left(\sqrt[4]{2} + \frac{1}{\sqrt[4]{3}}\right)^n$, if the ratio of the 5th term from the beginning to the 5th term from the end is $\frac{\sqrt{6}}{1}$, find n . (Subjective Numerical)

24 If α is the only real root of $x^3 + bx^2 + cx + 1 = 0$ ($b < c$), then the value of $[[\alpha]]$ is (where, $[.]$ represents the greatest integer function) (Subjective Numerical)

25 In a ΔABC , right-angled at B, the value of cosec C is 4. If the value of the expression $[\sin^2 A \sec^2 A - 4 \sin C]$ is (2λ) , then value of λ is (Subjective Numerical)

Date : 09 - 08 - 2020

ANTS FULL TEST (TEST CODE) : FT # 28
(JEE MAIN PATTERN)
Target : JEE Main - 2020

IMPORTANT INSTRUCTIONS

1. Immediately fill the particulars on this page of the Test Booklet with Blue/Black Point Pen. Use of Pencil is strictly prohibited.
2. When you are directed, fill in the particulars of the Answer Sheet carefully.
3. The test is 3 hours duration.
4. The Test Booklet consists of **75** questions. The maximum marks are **300**.
5. There are **3** parts in the question paper **Physics, Chemistry and Mathematics** having **25** questions each.
6. In each of the above three parts 20 questions will be MCQs and 5 questions will have answer to be filled as numerical value.
7. **Marking Scheme**
 - (i) Marking Scheme for MCQs -

Correct Answer	Four Mark (+4)
Incorrect Answer	Minus one Mark (-1)
Unanswered/Marked for Review	No mark (0)
 - (ii) Marking Scheme for questions for which answer is numerical value

Correct Answer	Four Mark (+4)
Incorrect Answer	No mark (0)
Unanswered/Marked for Review	No mark (0)

Filling the ORS (Optical Response Sheet) :

Use only Black ball point pen only for filling the ORS. Do not use Gel/Ink pen as it might smudge the ORS.

8. Write your Roll no. in the books given. Also darken the corresponding bubbles with Black ball point pen only. Also fill your roll no in the space provided.
9. **Fill your Paper Code as mentioned on the Test Paper.**
10. If student does not fill his/her roll no. and paper code correctly and properly, then his/her marks will not be displayed and 5 marks will be deducted (paper wise) from the total.
11. Since it is not possible to erase and correct pen filled bubble, you are advised to be extremely careful while darkening the bubble corresponding to your answer.
12. Neither try to erase/rub/scratch the option nor make the Cross(X) mark on the option once filled. Do not scribble, smudge, cut, tear, or wrinkle the ORS. Do not put any stray marks or whitener anywhere on the ORS.
13. If there is any discrepancy between the written data and the bubbled data in your ORS the bubbled data will be taken as final.

Name of the candidate

I have read all the instructions and shall abide by them

.....
Signature of the Candidate

Roll Number :

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I have read all the instructions and shall abide by them

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Signature of the Candidate