SPR SCHOOL OF EXCELLENCE CLASS
RESIDENTIAL CAMPUS - YELLAPUR

SCHOOL OF EXCELLENCE

7R

IIT OLYMPIAD PROGRAMME MAINS MODEL TEST - 8

IMPORTANT INSTRUCTIONS :

(Time Duration: 90 Mins)

* **All Questions are compulsory.**
* **Each correct answer carries 3 marks.**
* **1 Mark will be deducted for each wrong answer,**
* **No mark is deducted if not attempted.**
* **All are single correct answers only.**

Syllabus:

MATHS	**: Elementary Geometry**
PHYSICS	**: Vectors**
CHEMISTRY	**: Mole Concept**

MATHEMATICS

1. **Find the value of x and y in the given figure.**

A) x = 109° & y = 34°

B) x = 110° & y = 35°

C) x = 120° & y = 23°

D) None of these
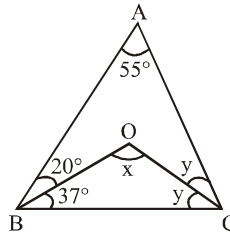
2. **AB || DC, then ∠ADC is equal to :**

(A) 90°

(B) 45°

(C) 60°

(D) 75°
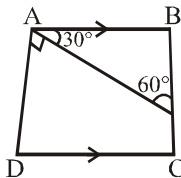
3. **1 decameter = _____ decimeters**

A) 10^2 B) 10^3 C) 10^4 D) 10^{-3}

4. **If an angle x° is equal to supplement, then the angle is**

A) $\dfrac{1}{3}$ right angle

B) $\dfrac{1}{4}$ straight angle

C) $\dfrac{1}{4}$ complete angle

D) $\dfrac{2}{5}$ Right angle

5. If two angles A and B which are complement to each other are in the ratio 3:2, then the angles

A) 54°, 36°   B) 60°, 30°   C) 70°, 20°   D) 44°, 46°

6. If $\dfrac{x}{2} = \dfrac{y}{3} = k$ and $x + y = 90°$, then angles x, y are

A) 18°, 72°   B) 36°, 54°   C) 30°, 60°   D) 25°, 63°

7. If $\left(\dfrac{3}{5}x\right) + 30° = 90°$; $\left(\dfrac{5}{6}y\right) - 20° = 180°$; $\left(\dfrac{z}{3} + \dfrac{z}{5}\right) = 40°$ and $4a = 360°$, then angles x, y, z, a are
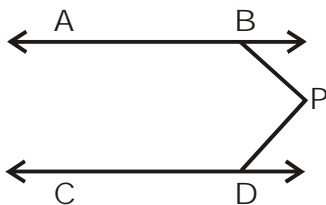
A) Obtuse, reflex, right, acute   B) Obtuse, reflex, acute, right

C) right, reflex, obtuse, acute   D) acute, obtuse, reflex, right

8. From the given diagram, If CD ‖ LA and DE ‖ AC, then the length of EC is

A) 8 cm

B) 6 cm

C) 4 cm

D) 2 cm
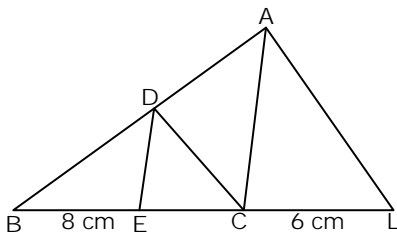
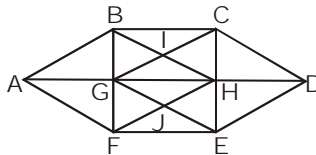**9.** If AB ‖ CD and P is any point as shown in the figure, then $\angle ABP + \angle BPD + \angle CDP$ is

A) 72°   B) 180°   C) 540°   D) 360°

10. If $\dfrac{2}{3}\angle A = \dfrac{3}{4}\angle B = \dfrac{5}{6}\angle C = x$, then the ratio of angles $\angle A : \angle B : \angle C$ is

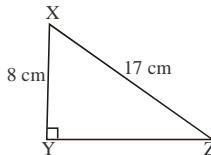   A) 45:36:40:   B) 40:45:36   C) 45:40:36   D) 36:45:40

11. How many triangles are there in the following figure ? Find out its number among the five given alternatives ?

    A) 20

    B) 24

    C) 28

    D) 32

12. What is the length of $\overline{YZ}$?

    A) 9 cm

    B) 15 cm

    C) 19 cm

    D) 25 cm

13. An acute angle is an angle whose measure is between $0°$ and $90°$. Using the ray in the diagram, how many different acute angles can be formed ?

    A) 12

    B) 9

    C) 15

    D) 10
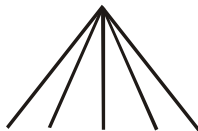
14. In the figure below (not to scale), $\overline{PQ} \parallel \overline{TS},$ reflex $\angle QRS = 300°$ and $x - y = 30°$. THe measure of y will be -

    A) $25°$

    B) $15°$

    C) $20°$

    D) $30°$

15. If D is the midpoint of the hypotenuse AC of isosceles right angled △ ABC, △ ADB ≅ BDC according to _____ condition

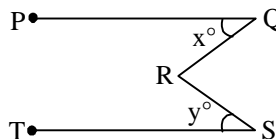   A) ASA   B) SAS   C) SSS   D) RHS

PHYSICS

16. The horizontal component of the weight of a body of mass m is

   A) mg   B) $\frac{mg}{2}$ C) Zero   D) Infinity

17. Find the rectangular components (along X and Y axis) of a velocity vector $10\sqrt{3}$ m/s, making an angle of 60° to the X - axis

   A) $5\sqrt{3}$, 15   B) $5\sqrt{3}$, 20   C) $10\sqrt{3}$, 20   D) $10\sqrt{3}$, 15

18. Vector $\vec{A}$ makes equal angles with *x, y* and *z* axis. Value of its components (in terms of magnitude of $\vec{A}$) will be

   A) $\frac{A}{\sqrt{3}}$ B) $\frac{A}{\sqrt{2}}$ C) $\sqrt{3}\,A$ D) $\frac{\sqrt{3}}{A}$

19. How many minimum number of coplanar vectors having different magnitudes can be added to give zero resultant

   A) 2   B) 3   C) 4   D) 5

20. A particle moves along a circle with uniform speed V. When it has moved through an angle 60°, change in its velocity is

   A) zero   B) $\sqrt{3}$ V   C) 3V   D) V

21. Which of the following set of forces law keep an object in equilibrium

   A) 5N, 6N, 1N   B) 5N , 4N, 7N   C) 1N, 2N, 5N   D) 5N, 6N, 20N

22. From the figure,

   A) $\vec{A}+\vec{B}=\vec{C}$ B) $\vec{B}+\vec{C}=\vec{A}$

   C) $\vec{C}+\vec{A}=\vec{B}$ D) $\vec{A}+\vec{B}+\vec{C}=\vec{O}$
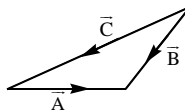
23. The maximum and minimum resultants of two forces are in the ratio 7 : 3. The ratio of the forces is

    A) $5 : 2$ B) $\sqrt{7} : \sqrt{3}$ C) $49 : 9$ D) $4 : 1$

24. A body is in equilibrium under the action of three coplanar forces *P, Q* and *R* as shown in the figure. Select the correct statement

    A) $\dfrac{P}{\sin \alpha} = \dfrac{Q}{\sin \beta} = \dfrac{R}{\sin \gamma}$
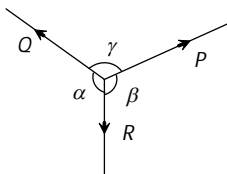
    B) $\dfrac{P}{\cos \alpha} = \dfrac{Q}{\cos \beta} = \dfrac{R}{\cos \gamma}$

    C) $\dfrac{P}{\tan \alpha} = \dfrac{Q}{\tan \beta} = \dfrac{R}{\tan \gamma}$

    D) $\dfrac{P}{\sin \beta} = \dfrac{Q}{\sin \gamma} = \dfrac{R}{\sin \alpha}$

25. *P, Q* and *R* are three coplanar forces acting at a point and are in equilibrium. Given $P = 1.9318\ kg\ wt,$ $\sin \theta_1 = 0.9659,$ the value of *R* is (in *kg wt*)

    A) 0.9659

    B) 2

    C) 1

    D) $\dfrac{1}{2}$

26. Following sets of three forces act on a body. Whose resultant cannot be zero

    A) 10, 10, 10   B) 10, 10, 20   C) 10, 20, 23   D) 10, 20, 40

27. $\vec{A} = 2\hat{i} + \hat{j}, B = 3\hat{j} - \hat{k}$ and $\vec{C} = 6\hat{i} - 2\hat{k}$ Value of $\vec{A} - 2\vec{B} + 3\vec{C}$ would be
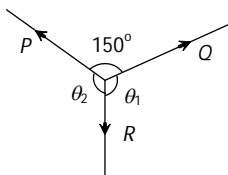
A) $20\hat{i} + 5\hat{j} + 4\hat{k}$ B) $20\hat{i} - 5\hat{j} - 4\hat{k}$

C) $4\hat{i} + 5\hat{j} + 20\hat{k}$ D) $5\hat{i} + 4\hat{j} + 10\hat{k}$

28. **A truck travelling due north at 20 *m/s* turns west and travels at the same speed. The change in its velocity be**

A) 40 *m/s* N–W   B) $20\sqrt{2}$ *m/s* N–W

C) 40 *m/s* S–W   D) $20\sqrt{2}$ *m/s* S–W

29. **As shown in figure the tension in the horizontal cord is 30 *N*. The weight *W* and tension in the string *OA* in Newton are**

A) $30\sqrt{3}$, 30

B) $30\sqrt{3}$, 60

C) $60\sqrt{3}$, 30

D) None of these
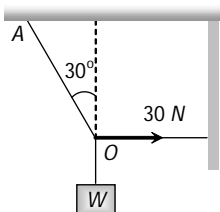
30. **A body of 10 kg is suspended by a rope 50cm long and is pulled to a side through a horizontal distance of 30 cm by means of a horizontal force. Then that horizontal force is**

A) 7.5 kg – wt   B) 15 kg – wt   C) 20 kg – wt   D) 30 kg – wt

CHEMISTRY

31. **The number of moles of carbon dioxide which contain 8 g of oxygen is**

A) 0.5 mol   B) 0.20 mol   C) 0.40 mol   D) 0.25 mol

32. **The total no of ions present in 111 g of $CaCl_2$ is**

A) One mole   B) Two mole   C) Three mole   D) Four moles

33. **Which has maximum number of atoms ?**

A) 24g of c (12)   B) 56g of Fe (56)

C) 27g of Al (27)   D) 108g of Ag (108)

34. One mole of oxygen gas is the volume of .

A) 1 litre of oxygen at S.T.P.

B) 32 litres of oxygen at S.T.P.

C) 22.4 litres of oxygen at S.T.P.

D) 6.02×10^{23} molecules of oxygen at any temperature and pressure.

35. Total number of atoms present 17 g of NH_3 is

A) 6.02×10^{23} B) $2 \times 6.02 \times 10^{23}$

C) $3 \times 6.02 \times 1 10^{23}$ D) 4×10^{-24} g

36. 5.6 litres of oxygen at NTP is equivalent of

A) 1 mole   B) 1/2 mole   (C) 1/4 Mole   D) 1/8 mole

37. 11.2 Litres of a gas at STP weighs 14g. The gas could not be :

A) N_2O B) CO   C) B_2H_6 D) N_2

38. Which one of the following statements is incorect ?.

A) One gram atom of carbon contains avogadro's number of atoms.

B) One mole of oxygen gas contains Avogadro's number of atoms.

C) One mole of hydrogen contains Avogadro's number of atoms.

D) One mole of electrons stands for 6.02×10^{23} electrons

39. One mole of atoms of oxygen represents

A) 6.02×10^{23} atoms of oxygen   B) 32 g of oxygen

C) 22.4L of O_2 at STP   D) 8g of oxygen

40. One mole of sodium represents

A) 6.02×10^{23} atoms of sodium   B) 46 gms of sodium

C) 11g of sodium   D) 34.5g of sodium

41. The weight of 0.1 mole of Na_2CO_3 is

A) 106 g   B) 10.6 g   C) 5.3 g   D) 6.02×10^{22}g

42. The ratio between the number of molecules in equal masses of CH_4 and SO_2 is

A) 1:1   B) 4:1   C) 1:4   D) 2:1

43. **What is the mole percentage of O_2 in a mixture of 7g of N_2 and 8g of O_2?**

   A) 25% B) 75% C) 50% D) 40%

44. **Which of the following gases has the highest density under standard conditions?**

   A) CO B) N_2O C) C_3H_8 D) SO_2

45. **Which contains more number of molecules?**

   A) 1 mole of carbon dioxide B) 4g of hydrogen
   C) 33.6 litres of oxygen at STP D) 6g of helium

MENTAL ABILITY

Directions: In each of the following questions, a number series is given with one term missing. Choose the correct alternative that will continue the same pattern and replace the question mark in the given series.

46. **1, 9, 25, 49, ?, 121**
   (A) 64 (B) 81 (C) 91 (D) 100

47. **4, 7, 12, 19, 28, ?**
   (A) 30 (B) 36 (C) 39 (D) 49

48. **11, 13, 17, 19, 23, 25, ?**
   (A) 26 (B) 27 (C) 29 (D) 37

49. **6, 12, 21, ?, 48**
   (A) 33 (B) 38 (C) 40 (D) 45

50. **2, 5, 9, ?, 20, 27**
   (A) 14 (B) 16 (C) 18 (D) 24

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