SPR SCHOOL OF EXCELLENCE

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CLASS

RESIDENTIAL CAMPUS - YELLAPUR 10K1K2

IIT OLYMPIAD PROGRAMME

MAINS MODEL TEST - 3

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:

MATHEMATICS : Permutations & Combinations

PHYSICS : Units and Dimensions and Heat

CHEMISTRY : Ch

MATHS

1. ${}^{n+5}P_{n-1} = \frac{11(n-1)}{2}\ {}^{n+3}P_{n}$ **then the value of n is**

A) 2 or 6 B) 2 or 11 C) 7 or 11 D) 6 or 7

2. **A coin is tossed three times and outcomes are recorded. The number of possible outcomes are.**

A) 10 B) 8 C) 4 D) 2

3. **A house has 4 doors and 5 windows. In how many ways can a thief commit the theft by entering through a window and exiting through a door.**

A) 25 B) 22 C) 20 D) 80

4. **A set A has 6 elements. The number of ways of selecting two subsetz P and Q of A such that P and Q are disjoint is**

A) 64 B) 128 C) 243 D) 729

5. **How many 9 digit numbers of different digits can be formed ?**

A) 0926532 B) 2356290 C) 3692250 D) 3265920

6. **The value of $1+1.1!+2.2!+3.3!+....+n.n!$**

A) $(n+1)!$ B) $(n+2)!$ C) $(n+3)!$ D) $(n+2)$

7. **In a class of 10 students. there are 3 digits A,B,C. The number of different ways that they can be arranged in a row such that no two of the three girls are consecutive is**

A) 10! B) 7! 8! C) 7! 8!/5! D) 7! 8!3!/5!

8. **if $^{2n-1}P_n : {}^{2n+1}P_{n-1} = 22 : 7$.n value is..**

A) 7 B) 8 C) 9 D) 10

9. **Three men have 4 coats, 5 waist coats 6 caps. In how many ways can they wear them ?**

A) 17280 B) 172828 C) 172800 D) 170028

10. **Nine articles are to be placed in nine boxes one in each box. Five of them are too big for three of the boxes. Find the number of possible arrangements.**

A) 17280 B) 172828 C) 172800 D) 170028

11. **Find how many arrangements can be made with the letters of the word 'MATHEMATICS'. In how many of them the vowels occur together ?**

A) 120690 B) 110690 C) 129600 D) 120960

12. **The sum of all four digited numbers that can be formed using the digits 0,2,4,7,8**

A) 479952 B) 497952 C) 545958 D) 547598

13. **How many numbers greater than a million can be formed by using the digits 4, 6, 0, 6, 7, 4, 6 ?**

A) 330 B) 360 C) 340 D) 320

14. Eight different letters of an alphabet are given. Words of four letters from these are formed. The number of such words with at least one letter repeated is

A) $\binom{8}{4} - {}^{8}P_4$ B) $8^4 + \binom{8}{4}$ C) $8^4 - {}^{8}P_4$ D) $8^4 - \binom{8}{4}$

15 How many of the numbers from 1000 to 9999 (both inclusive) do not have four different digits ?

A) 4464 B) 4644 C) 4664 D) 4664

PHYSICS

16. If the units of length, mass and time are doubled, the unit of force will be

A) doubled B) halved C) quadrupled D) unchanged

17. The lower fixed point of a thermometer scale is the temperature of melting

A) ice B) water C) mercury D) alcohol

18. The freezing point on a thermometer is marked as 20° and the boiling point at as 150°. A temperature of 60°*C* on this thermometer will be read as

A) 40° B) 65° C) 98° D) 110°

19. The set of quantities which cannot form a group of fundamental quantities in any system of measurement is

A) Length, Mass and Time B) Length, Mass and velocity

C) Mass, time and velocity D) Length, Time and velocity

20. Absolute zero on Celsius scale is

A) 100°C B) 80°C C) –273°C D) –12°C

21. The absolute zero temperature in Fahrenheit scale is

A) – 273°*F* B) – 32°*F* C)– 460°*F* D) – 132°*F*

22. Express 100° F in degree celsius.

A) 37.8°C B) 40°C C) 80°C D) 32°C

23. Heat always flows from

A) higher temperature to lower temperature

B) lower temperature to higher temperature

C) sometimes higher to lower and lower to higher temperature

D) none of these

24. If force F, LengthL and timeT are chosen as fundamental quantities,the dimensional formula for Mass is

A) FLT B) $F^{-1}L^{-1}T^{-2}$ C) $F^{-2}L^{-2}T^{-2}$ D) $F^{1}L^{-1}T^{2}$

25. If a body is at a temperature higher than the room temperature the level of mercury in the thermometer's stem

A) falls B) remain at the same position

C) rises D) may rise or fall

26. The velocity of an object varies with time as V = $At^2 + Bt + C$ **. Taking the unit of time as1 sec and Velocity as ms^{-1}, the units of A, B, C respectively are:**

A) $ms^{-3}, ms^{-2}, ms^{-1}$ B) $ms^{-2}, ms^{-1}, ms^{-3}$ C) $ms^{-1}, ms^{-2}, ms^{-3}$ D) $ms^{-1}, ms^{-1}, ms^{-1}$

27. A faulty centigrade thermometer is examined. The upper and lower points are found to be 99.5°C and 0.5°C respectively. What is the correct temperature if this faulty thermometer reads 15.5 ?

A) 15.15°C B) 16.16°C C) 17.17°C D) 18.18°C

28. Identify the pairs having identical dimensions

A) Linear momentum and moment of force

B) Planck constant and angular momentum

C) Pressure and modulus of elasticy

D) Work and torque

29. A 1K rise in temperature is

A) the same as a 1°C rise in temperature

B) the same as a 1°F rise in temperature

C) more than a 1°C rise in temperature

D) less than a 1°F rise in temperature

30. Which of the following pairs have same dimensions?

A) Torque and work

B) Angular momentum and work

C) Energy and you'ng's modulus

D) Light year and wavelength

CHEMISTRY

31.

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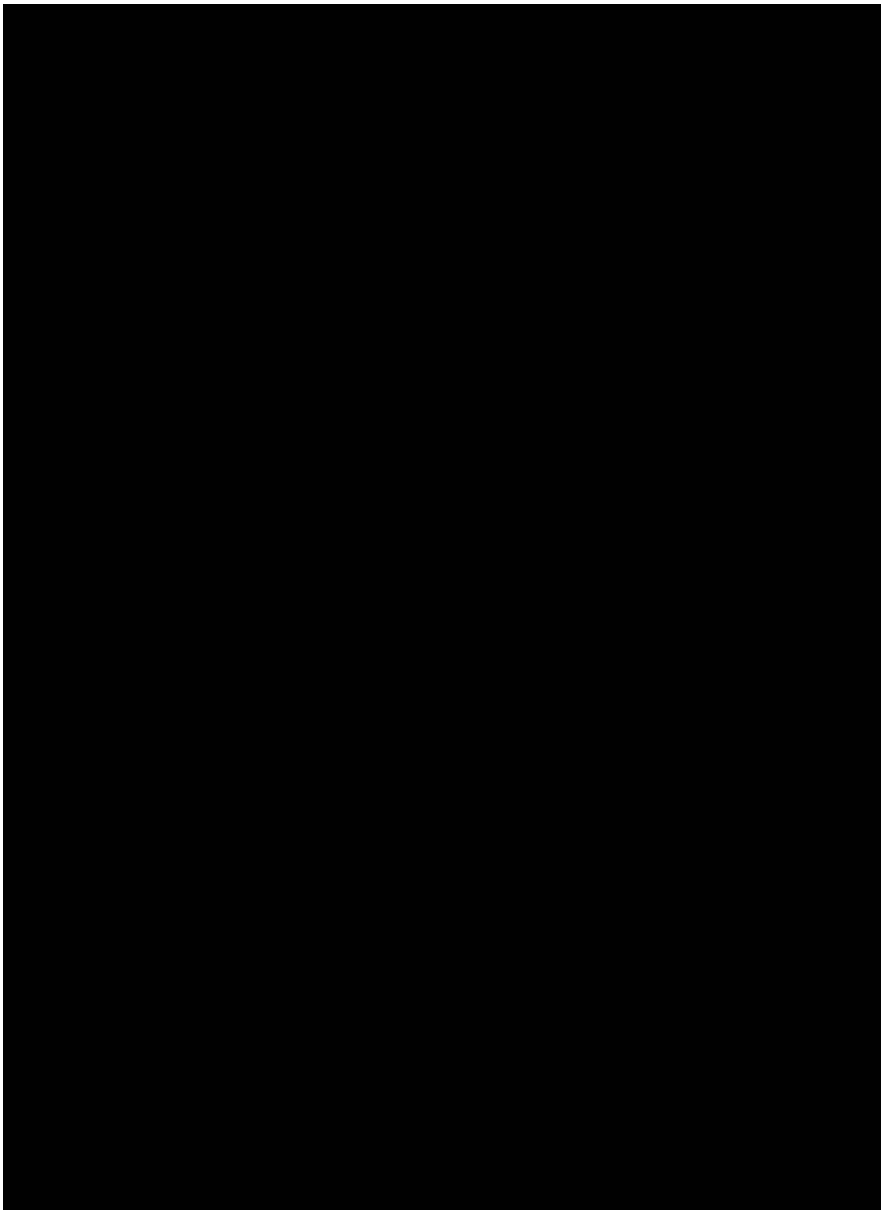
IIT FOUNDATION ACADEMY

E40:: MAINS MODEL TEST - 3 :: KEYSHEET



17. **[1]**

The lower fixed point of a thermometer scale is the temperature of melting ice .

18. (c)Temperature on any scale can be converted into other scale by

$$\frac{X - LFP}{UFP - LFP}$$

= Constant for all scales

$$\therefore \frac{X - 20^\circ}{150^\circ - 20^\circ} = \frac{C - 0^\circ}{100^\circ - 0^o} \Rightarrow X = \frac{C \times 130^\circ}{100^\circ} + 20^\circ$$

$$= \frac{60^\circ \times 130^\circ}{100^\circ} + 20^\circ = 98^\circ$$ (c)Temperature on any scale can be converted into other scale by $\frac{X - LFP}{UFP - LFP}$

= Constant for all scales

$$\therefore \frac{X - 20^\circ}{150^\circ - 20^\circ} = \frac{C - 0^\circ}{100^\circ - 0^o} \Rightarrow X = \frac{C \times 130^\circ}{100^\circ} + 20^\circ$$

$$= \frac{60^\circ \times 130^\circ}{100^\circ} + 20^\circ = 98^\circ$$

20. **[3]**

Absolute zero on celsius scale is –273°C.

21. (c) $\frac{F - 32}{9} = \frac{K - 273}{5} \Rightarrow \frac{F - 32}{9} = \frac{0 - 273}{5}$

$$\Rightarrow F = -459.4^\circ F \approx -460^\circ F$$

22. **[1]**

From relation

$$\frac{C}{5} = \frac{F - 32}{9} \Rightarrow \frac{C}{5} = \frac{100 - 32}{9} \Rightarrow \frac{C}{5} = \frac{68}{9}$$

$$\Rightarrow C = \frac{340}{9} = 37.8$$

$\therefore$ 100°F = 37.8°C

27. We have,

$$\frac{\text{Reading} - \text{Lower point}}{\text{Upper point} - \text{Lower point}} = \text{constant}$$

If x = correct temperature in °C

then,

$$\frac{x - 0}{100 - 0} = \frac{15.5 - 0.5}{99.5 - 0.5} \quad \Rightarrow \frac{x}{100} = \frac{15}{99} \Rightarrow 99x = 100 \times 15$$

$$\Rightarrow x = \frac{100 \times 15}{99} = 15.15°C$$

$\therefore$ Correct temperature = 15.15°C