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1. Which of the following rays are not electromagnetic waves?

$\gamma$  rays

$\beta$  rays

Heat rays

X – rays

2. A car travelling at a speed of 30 km/hour is brought to a halt in 8 m by applying brakes. If the same car is travelling at 60 km/hour, it can be brought to a halt with the same braking force in

8m

16m

24m

32m

3. A ball is released from certain height. It loses 50% of its kinetic energy on striking the ground. It will attain a height again equal to

One fourth the initial height

Half the initial height

Three fourth initial height

None of these

4. Four point +ve charges of same magnitude (Q) are placed at four corners of a rigid square frame as shown in figure. The plane of the frame is perpendicular to axis. If a -ve point charge is placed at a distance z away from the above frame ( $z \ll L$ ) then

It oscillates along the Z axis.

It moves away from the frame.

It moves slowly towards the frame and stays in the plane of the frame.

It passes through the frame only once.

5. Two resistors are connected (a) in series (b) in parallel. The equivalent resistance in the two cases are 9 ohm and 2 ohm respectively. Then the resistances of the component resistors are

2 ohm and 7 ohm

3 ohm and 6 ohm

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3 ohm and 9 ohm

5 ohm and 4 ohm

6. Three charges  $4q$ ,  $Q$  and  $q$  are in a straight line in the position of  $0$ ,  $l/2$  and  $l$  respectively. The resultant force on  $q$  will be zero, if  $Q =$

$-q$

$-2q$

$-\frac{q}{2}$

$4q$

7. A solid conducting sphere of radius  $a$  has a net positive charge  $2Q$ . A conducting spherical shell of inner radius  $b$  and outer radius  $c$  is concentric with the solid sphere and has a net charge  $-Q$ . The surface charge density on the inner and outer surfaces of the spherical shell will be

$-\frac{2Q}{4\pi b^2}, \frac{Q}{4\pi c^2}$

$-\frac{Q}{4\pi b^2}, \frac{Q}{4\pi c^2}$

$0, \frac{Q}{4\pi c^2}$

None of the above

8. For a thermocouple, the neutral temperature is  $270^\circ C$  and the temperature of its cold junction is  $20^\circ C$ . If there is no deflection in the galvanometer, the temperature of the hot junction should be

$210^\circ C$

$540^\circ C$

$520^\circ C$

$209^\circ C$

9. A mass of  $20\text{ kg}$  moving with a speed of  $10\text{ m/s}$  collides with another stationary mass of  $5\text{ kg}$ . As a result of the collision, the two masses stick together. The kinetic energy of the composite mass will be

$600\text{ joule}$

$800\text{ joule}$

$1000\text{ joule}$

$1200\text{ joule}$

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10. A bag (mass  $M$ ) hangs by a long thread and a bullet (mass  $m$ ) comes horizontally with velocity  $v$  and gets caught in the bag. Then for the combined (bag + bullet) system

Momentum is  $\frac{mvM}{M+m}$

Kinetic energy is  $\frac{mv^2}{2}$

Momentum is  $\frac{mv(M+m)}{M}$

Kinetic energy is  $\frac{m^2v^2}{2(M+m)}$

11. A liquid of mass  $m$  and specific heat  $c$  is heated to a temperature  $2T$ . Another liquid of mass  $m/2$  and specific heat  $2c$  is heated to a temperature  $T$ . If these two liquids are mixed, the resulting temperature of the mixture is

$(2/3)T$

$(8/5)T$

$(3/5)T$

$(3/2)T$

12. Two spheres made of same substance have diameters in the ratio  $1 : 2$ . Their thermal capacities are in the ratio of

$1 : 2$

$2 : 1$

$1 : 4$

$1 : 8$

13. In an election there are 5 candidates and three vacancies. A voter can vote maximum to three candidates and should vote at least one, then in how many ways can he vote?

125

60

10

25

14. If the given planes  $ax + by + cz + d = 0$  and  $a'x + b'y + c'z + d' = 0$  be mutually perpendicular, then

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$$\frac{a}{a'} = \frac{b}{b'} = \frac{c}{c'}$$

$$\frac{a}{a'} + \frac{b}{b'} + \frac{c}{c'} = 0$$

$$aa' + bb' + cc' + dd' = 0$$

$$aa' + bb' + cc' = 0$$

15.The number of 3 digit odd numbers, that can be formed by using the digits 1, 2, 3, 4, 5, 6 when the repetition is allowed, is

60

108

36

30

16.The foot of the perpendicular drawn from the point (3,2,5) on zx plane is :

(3,0,0)

(0,2,5)

(3,4,0)

(3,0,5)

17.The equation of plane normal to line joining (1, 0, 2) and (2, 4, 3) is:

$$x + 4y + z = 0$$

$$x - 4y - z = 0$$

$$-x + 4y - z = 0$$

none of the above

18.The equation of a straight line in xy plane can be written as:

$$y = mx + c$$

$$x = ly + a$$

either (a) or (b)

None of these

19.The point (2, 3) lies ..... the ellipse  $3x^2 + 4y^2 = 12$

inside

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outside

exactly on

none of the above

20.If  $I$  is an identity matrix of order  $n$  then  $3I - I^2$  is a :

null matrix

scalar matrix

triangular matrix

diagonal matrix

21.The function  $x^x$  is increasing, when :

$$x > \frac{1}{e}$$

$$x < \frac{1}{e}$$

$$x < 0$$

For all real  $x$

22.  $\int \frac{1}{x^3 + 1} dx =$

$$\frac{\ln(|x+1|)}{3} - \frac{\ln(x^2-x+1)}{6} + \frac{\arctan\left(\frac{2x-1}{\sqrt{3}}\right)}{\sqrt{3}} + C$$

$$\frac{\ln(|x-1|)}{3} - \frac{\ln(x^2+x+1)}{6} + \frac{\arctan\left(\frac{2x-1}{\sqrt{3}}\right)}{\sqrt{3}} + C$$

$$\frac{\ln(|x-1|)}{3} - \frac{\ln(x^2-x+1)}{6} + \frac{\arctan\left(\frac{2x-1}{\sqrt{3}}\right)}{\sqrt{3}} + C$$

$$\frac{\ln(|x+1|)}{3} - \frac{\ln(x^2-x-1)}{6} + \frac{\arctan\left(\frac{2x-1}{\sqrt{3}}\right)}{\sqrt{3}} + C$$

23.The line perpendicular to the line  $ax + by + c = 0$  which passes through  $(b, a)$  is :

$$ax + by = a^2 + b^2$$

$$bx - ay = (b-a)(b+a)$$

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$$bx - ay = (a - b)(b + a)$$

$$bx + ay = b^2 + a^2$$

24. If  $X = \begin{bmatrix} \alpha & 1 \\ 1 & 0 \end{bmatrix}$  and  $X^2$  is an identity matrix, then,  $\alpha =$

0

1

2

3

25.  $f(x) = x^2 - 3x$ , then the points at which  $f(x) = f'(x)$  are

1, 3

1, -3

-1, 3

None of these

26. The sum of magnitude of two forces is 18 N and resultant whose direction is at right angles to the smaller force is 12N. The magnitude of the two forces are:

13, 5

12, 6

14, 4

11, 7

27.

$$\int_0^{\pi} \frac{dx}{1 + \sin x} =$$

0

$\frac{1}{2}$

2

$\frac{3}{2}$

28. If  $\alpha, \beta, \gamma$  are angles of a triangle, then  $\sin^2 \alpha + \sin^2 \beta + \sin^2 \gamma - 2 \cos \alpha \cos \beta \cos \gamma$  is

2

-1

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-2

0

29. Which one of the following is diamagnetic ?

$CO$

$O_2$

$B_2$

None of these

30. Which of the following set of quantum numbers is not permitted?

$n = 4, l = 3, m = 0$

$n = 4, l = 0, m = 0$

$n = 4, l = 2, m = 0$

$n = 4, l = 4, m = 1$

31. Oxidation number of S in  $SO_4^{2-}$

• 6

• 3

• 2

-2

32. Refractory materials are generally used in furnaces because

They possess great structural strength

They can withstand high temperature

They are chemically inert

They do not require replacement

33. The solubility of  $BaSO_4$  in water  $2.42 \times 10^{-3} \text{ g L}^{-1}$  at 298K. The value of its solubility product is (Given molar mass of  $BaSO_4 = 233 \text{ g mol}^{-1}$ )

$1.08 \times 10^{-14} \text{ mol}^2 \text{ L}^{-2}$

$1.08 \times 10^{-12} \text{ mol}^2 \text{ L}^{-2}$

$1.08 \times 10^{-10} \text{ mol}^2 \text{ L}^{-2}$

$1.08 \times 10^{-8} \text{ mol}^2 \text{ L}^{-2}$

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34.The IUPAC name of  $(C_2H_5)_2CHCH_2OH$  is

2-ethyl butanol-1

2-methyl pentanol-1

2-ethyl pentanol-1

3-ethyl butanol-1

35.If  $N_A$  is Avogadro's number then number of valence electrons in 4.2 g of nitride ions ( $N^{3-}$ )

2.4  $N_A$

4.2  $N_A$

1.6  $N_A$

3.2  $N_A$

36.The gas formed by roasting galena acts as O.A. When its is treated with

$H_2S$

$K_2Cr_2O_7/H^+$

$KMnO_4/H^+$

$Cl_2/H_2O$

37.Choose the correct sentence:

Faster we go, sooner we reach.

The fast we go, the soon we reach.

Faster we go, soon we reach.

The faster we go, the sooner we reach.

38.He bought \_\_\_\_ Bible.

a

an

the

none

39.Which syllable is stressed in the word 'question'?

first

second



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third

fourth

40.Nobody writes to me, ...?

don't they

don't nobody

do they

all of above