# [BBSS, PHYSICS GRADE 10 MODEL EXAMINAT] IN 2ND SEMESTER OF 2016

**GENERAL DIRECTIONS** **Time Given: 120 minute (2 hr)**

THIS BOOKLET CONTAINS **PHYSICS MODEL EXAMINATION** FOR GRADE **10** STUDENTS. IN THIS EXAMINATION, THERE ARE TOTAL **50** MULTIPLE CHOICE ITEMS. ATTEMPT ALL THE ITEMS. THERE IS ONLY ONE BEST ANSWER FOR EACH ITEM CHOOSES THE BEST ANSWER MORE FROM THE SUGGESTED OPTIONS AND WRITE THE LETTER OF YOUR CHOICE ON THE ANSWER SHEET.

ANY FORM OF CHEATING OR AN ATTEMPT TO CHEAT IN THE EXAMINATION HALL WILL RESULT IN AUTOMATIC DISMISSAL FROM THE EXAMINATION AND CANCELATION OF YOUR SCORES

## CHOOSE THE BEST ANSWER FOR EACH QUESTION

1. The direction of the electric field due to a positive Pont charge is
   A) Direction of the force that is exerted on the positive charge
   B) Opposite to direction of the force that is exerted on the positive charge
   C) Electric field inwards radially from a positive charge
   D) Electric field encircles around a positive charge.

   Explanation

   **The direction of the field is taken as the direction of the force that is exerted on the positive charge. Thus, the electric field extends radially from a positive charge and inwards from a negative point charge.**

2. One is **not** a reason why a birds sitting and even running along electric line wires high in the air without getting shocked.
   A) They are not good conductor
   B) They have a mass less than 1kg
   C) There is no voltage difference on a single wire
   D) bird are not connected to the ground

   Explanation

   The reason why a birds sitting and even running along electric line wires high in the air without getting shocked are:
   - ✓ They are not good conductor
   - ✓ There is no voltage difference on a single wire
   - ✓ bird are not connected to the ground (the circuit will be open )
   - ✓ the mass of the birds have no effect on shocking of birds.

3. A wire of initial length L and radius r has a measured resistance of 1Ω. The wire is drawn to a new uniform radius is reduced by half without changing its length. What is the new resistance of the wire?

A) 16 Ω B) 4Ω C) 8Ω D) ¼ Ω

Explanation

$R = \frac{\rho L}{A} = \frac{\rho L}{\pi r^2} = 1\Omega,\ where$ R is initial resistance; r is initial radius and $\rho$ is resistivity of wire.

But new r ($r_2$) is given as $r_2 = \frac{r}{2}$ then $R = \frac{\rho L}{\pi\left(\frac{r}{2}\right)^2} = 4\frac{\rho L}{\pi r^2}$ but $\frac{\rho L}{\pi r^2} = 1\Omega$

$$R = 4\frac{\rho L}{\pi r^2} = 4(1\Omega) = 4\Omega$$

4. How much potential difference is needed to move 720 C of charge in 2 minutes in a conductor that have 3 Ω resistances?

A) 360 V B) 240 V C) 6 V D) 2 V

Explanation

$$V = \frac{I}{R} = \frac{\frac{Q}{t}}{R} = \frac{Q}{Rt} = \frac{720\ C}{3\ \Omega\ \times 120\ s} = \frac{720\ C}{360\ \Omega\ s} = 2\ V$$

5. One of the following is **not** true about combination of resistor in a circuit

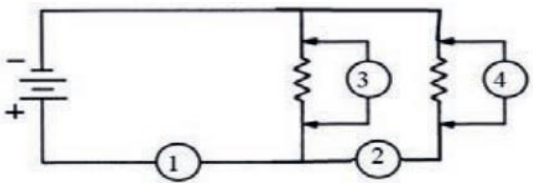
A) In a series circuit, there is more than one path for the current to flow.
B) In a parallel circuit, there are more than one path for the current to flow
C) The equivalent resistance in a series circuit is the sum of each resistance.
D) Buildings are wired using parallel circuit's rather than series circuits.

Explanation

- ✓ In a series circuit, there is a single path for the current to flow.
- ✓ In a parallel circuit, there are more than one path for the current to flow
- ✓ The equivalent resistance in a series circuit is the sum of each resistance.
- ✓ Buildings are wired using parallel circuit's rather than series circuits.

6. From the give figure which positions would be appropriate for the placement of voltmeter?

A) 3 and 4
B) 1 and 2
C) 1 and 3
D) 4 and 2




**Voltmeter should be connected parallel to the load (resistors)**

7. The degree of damage to the human body by an electric shock depends on the
   A) magnitude of the current
   B) part of the body through which it passes
   C) length of time it acts
   D) All

**Explanation**

The degree of damage to the human body by an electric shock depends on the:
- ✓ Magnitude of the current
- ✓ Length of time it acts
- ✓ Part of the body through which it passes

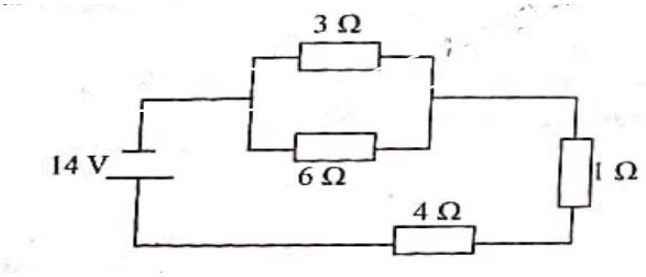
8. The potential difference between two large parallel metal plates is 120 V. The plate separation is 4.0 mm. What is electric field between the plates?
   A) 30 kV/m toward the negative plate
   B) 30 kV/m toward the positive plate
   C) 30V/m toward the negative plate
   D) 48 V/m toward negative plate

**Explanation**

$$E = \frac{V}{d} = \frac{120\ V}{4 \times 10^{-3}\ m} = 30 \times 10^{3}\ \frac{V}{m} = 30\ k\frac{V}{m}$$

✓ Direction of electric field is toward negative charge (away from positive charge)

9. Four resistors are connected to the voltage source as shown circuit diagram below. What are the current pass through the 6 Ω resistor and the voltage drop across the 4 Ω resistor respectively?




   A) $\frac{2}{3}$ A and 8 V
   B) $\frac{3}{2}$ A and 4 V
   C) $\frac{4}{3}$ A and 4 V
   D) $\frac{3}{4}$ A and 8 V

$R_{12}$=2 Ω, $R_T$= 7 Ω, $I_T$=2A , $V_{12}$=4V
$I_6$(at 6 Ω)=$V_{12}$/6 Ω=4/6 A =2/3A
V(at 4 Ω) =$I_T$*4 Ω = 8V

10. A tungsten wire has resistance **R** at 20°C. A second tungsten wire at 20 °C has twice the length and half the cross-sectional area of the first wire.
    In terms of **R**, the resistance of the second wire is
    A) $\frac{R}{2}$ B) R C) 2R D) 4R

11. Which one of the following is **not true** about types of magnets and their properties?
    A) When the magnetic field is removed, temporarily magnetized materials lose their magnetic properties
    B) When the magnetic field is removed, permanently magnetized materials lose their magnetic properties
    C) The strength of the magnetic field of electromagnet can be controlled by controlling the electric current.
    D) Permanently magnetized materials have their own magnetic field.
12. A bar magnet is divided in two pieces. Which of the following statements is true?
    A) The bar magnet is demagnetized. C) The magnetic poles are separated.
    B) Two new bar magnets are created. D) The electric field is created
13. A wire of length 400 m is placed in a 25 T magnetic field at angle of $30^o$. If a 2.5 N force acts on the wire, what is the value of the current in the wire?
    A) 0.1 A B) 0.5 A C) 1.0 A D) 5.0A

    **Explanation**

    $f = BILSIN\theta$ , $I = \frac{F}{B \times L \times sin30°} = \frac{25\ N}{0.25\ T \times 400\ m \times 0.5} = 0.5\ A$
14. Which one of the following is **true** about properties of magnet and magnetic field lines?
    A) The magnetic field is stronger at the poles because the field lines are less dense near the poles.
    B) The magnetic field points in the direction of the force experienced by the North Pole.
    C) Like poles of a magnet repel each other and bringing them together causes their magnetic field lines to converge (come together).
    D) Unlike poles of a magnet attract each other and bringing them together causes their magnetic field lines to diverge (bend out from each other).
15. A charged particle is moving in a magnetic field. What is the direction of the force on the particle due to the magnetic field?
    A) in the direction of the magnetic field
    B) in the direction opposite to which the particle is moving
    C) perpendicular to both the magnetic field and the velocity
    D) in the same plane as the magnetic field and the velocity

16. Lines of the magnetic field produced by a long straight wire carrying a current
A) in the direction of the current C) opposite to the direction of the current
B) radially outward from the wire D) circles that are concentric with the wire

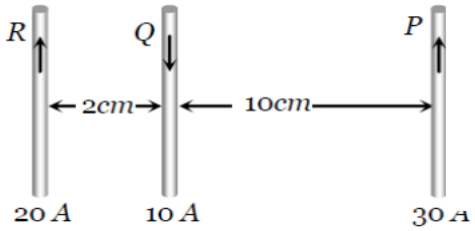
17. Two long, straight wires are parallel to each other. The wires carry currents of different magnitudes. If the amount of current owing in each wire is doubled, the magnitude of the force between the wires will be
A) Twice the magnitude of the original force.
B) Half of the magnitude of the original force.
C) Eight times the magnitude of the original force.
D) Four times the magnitude of the original force.

18. Determine the magnitude and direction of magnetic force on an electron traveling $5\times10^{7}$ m/s horizontally to the East in a vertically upward of magnetic field 0.5 T ($|q_e| = 1.6 \times 10^{-19}\ C$)?
A) $4 \times 10^{-12}\ N$ into the page B) $1.2 \times 10^{-12}\ N$ into the page
B) $4 \times 10^{-12}\ N$ out of the page D) $1.2 \times 10^{-12}\ N$ out of the page

**Explanation**

✓ $f = qvBsin\theta$ and angle between **B** and **V** is $90^{o}$
✓ To determine direction of force we use right hand rule or cross product.

19. Long, straight and parallel wires carrying currents are arranged as shown in figure below. The force experienced by 10 cm length of wire Q is:
($\mu_0 = 4\pi \times 10^{-7} \frac{Tm}{A}$)
A) $1.4 \times 10^{-4}\ N$ toward the right
B) $1.4 \times 10^{-4}\ N$ toward the left
C) $2.6 \times 10^{-4}\ N$ toward the right
D) $2.6 \times 10^{-4}\ N$ toward the left




**Explanation**

✓ Wire Q can experience a force on wire R and wire P. let we say force experienced on wire R by wire Q is $\mathbf{F_1}$ and force experienced on wire P by wire Q is $\mathbf{F_2}$.
✓ The force ($\mathbf{F_1}$) on wire R by Q is repulsive ( it act to the left)
✓ The force ($\mathbf{F_2}$) on wire P by Q is also repulsive ( it act to the right)

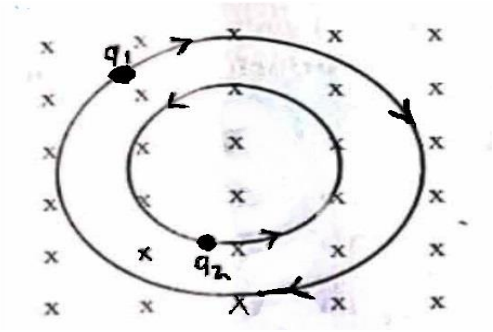
$$F_1 = \frac{\mu_o \times I_Q \times I_R \times L}{2\pi d} = \frac{4\pi \times 10^{-7}\frac{Tm}{A} \times 10\ A \times 20\ A \times 1 \times 10^{-1}m}{2\pi \times 2 \times 10^{-2}m}$$
$$= 2 \times 10^{-4}\ N\ \ to\ the\ left$$

$$F_2 = \frac{\mu_o \times I_Q \times I_P \times L}{2\pi d} = \frac{4\pi \times 10^{-7}\frac{Tm}{A} \times 10\,A \times 30\,A \times 1 \times 10^{-1}m}{2\pi \times 1 \times 10^{-1}m}$$
$$= 6 \times 10^{-5}\,N$$
$$= 0.6 \times 10^{-4}\,N \;\; to\ the\ right$$

Then we find the net force experienced by wire Q

$$F_{net} = F_1 - F_2 = 2 \times 10^{-4}\,N \;\; to\ the\ left - 0.6 \times 10^{-4}\,N \;\; to\ the\ right$$
$$= 1.4 \times 10^{-4}\,N \;\; to\ the\ left$$

20. Circular path followed by two charges $q_1$ *and* $q_2$ moving with the same speed in uniform magnetic field. If two charges have the same mass, which of the following is correct about sign of charges and magnitude of charges?




A) $q_1$ is negative, $q_2$ is positive and $|q_1| < |q_2|$

B) $q_1$ is negative, $q_2$ is positive and $|q_1| > |q_2|$

C) $q_1$ is positive, $q_2$ is negative and $|q_1| < |q_2|$

D) $q_1$ is positive, $q_2$ is negative and $|q_1| > |q_2|$

**Explanation**

- ✓ The particle moving anticlockwise direction in uniform magnetic field is taken as positive and particle moving clockwise direction in uniform magnetic field is taken as negative.
- ✓ The magnitude of charge is inversely proportional to the radius of curvature $\left(r = \frac{mv}{Bq}, q = \frac{mv}{rB}\right)$

21. When dealing with light rays, you are usually interested in the shape of a material and the angles at which light rays hit it. This kind of study is called
A) Geometrical optics B) Wave optics C) classical mechanics D) All

22. Which of the following is an ascending order of frequency?
A) Red, blue, yellow, green C) Red, yellow, green, blue
B) Red, green, yellow, blue D) Blue, green, yellow, blue

23. What happen as a ray of light passes from water to air?
A) The angle of incidence is less than the angle of reflection
B) The angle of incidence is greater than the angle of reflection
C) The angle of incidence is less than the angle of refraction
D) The angle of incidence is greater than the angle of refraction

24. An object is 10 cm in front of converging lens of focal length 20 cm. The nature of image is

A) Virtual, upright(erect) and magnified C) Virtual, inverted and magnified

B) Real, upright(erect) and magnified D) Real, upright(erect) and diminished

Explanation

$$given\ are: f = 20\ cm, u = 10\ \ cm$$

- ✓ $\frac{1}{v} = \frac{1}{f} - \frac{1}{u} = \frac{1}{20} - \frac{1}{10} = -\frac{1}{20},\ v = -20\ cm$
- ✓ The image is formed at 20 cm in front of lens, Therefore its virtual image.
- ✓ $m = -\frac{v}{u} = -\left(\frac{-20}{10}\right) = 2$. This shows the image is erect
- ✓ $m = \frac{h'}{h} = -\frac{v}{u}\ ,\ h' = m \times h = 2h$. This shows image is magnified.

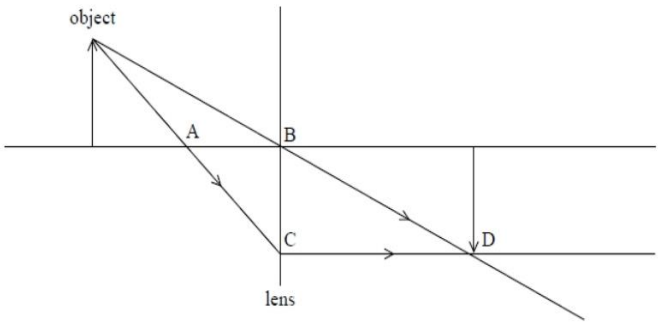
25. Light is incident from air (n=1) into glass$\left(n = \frac{8}{5}\right)$. If the speed of light in air is $3 \times 10^8\ m/s$, what will be its speed in the glass medium?

A) $1.9 \times 10^8\ m/s$ B) $2.1 \times 10^8\ m/s$ C) $4.8 \times 10^8\ m/s$ D) $3.0 \times 10^8\ m/s$

**Explanation**

- ✓ Given : $v_1 = 3 \times 10^8\ m/s, n_1 = 1,\ \ n_2 = 8/5$ . Required is $v_2$
- ✓ $\frac{n_2}{n_1} = \frac{v_1}{v_2}$ ,
- ✓ $v_2 = v_1 \times \frac{n_1}{n_2} = 3 \times 10^8 \frac{m}{s} \times \frac{1}{8/5}$
- ✓ $v_2 = 3 \times 10^8 \frac{m}{s} \times \frac{5}{8}$
- ✓ $v_2 = \frac{15}{8} \times 10^8 \frac{m}{s}$
- ✓ $v_2 = 1.9 \times 10^8\ m/s$

26. The diagram shows how an image is formed by an object that is placed a small distance from a thin converging lens. Which of the labels A, B, C or D represents the focal point of the lens?




A) D

B) C

C) A

D) B

27. What is the point on a mirror where light rays parallel to the mirror's surface converge after reflection?

A) Half of Focal length B) Center of curvature C) Principal focus D) pole

28. An object is placed 20 cm in front of a plane mirror. The mirror is moved 2 cm towards the object. The distance between the positions of the original and final images seen in the mirror is:

A) 2 cm B) 4 cm C) 10 cm D) 22 cm

**Explanation**

- ✓ **Given:** u = 20 cm and v = 20cm behind mirror
- ✓ $u' = 18\ cm\ \ and$
- ✓ $v' = 18cm\ behined\ mirror\ at\ new\ position$
- ✓ $v' = 16\ cm\ behined\ mirro\ at\ original\ position$
- ✓ $\Delta d = 20\ cm - 16\ cm = 4\ cm$

29. The mage formed by plane mirror is

A) Real and erect C) Real and inverted

B) Virtual and erect D) Virtual and inverted

30. A concave lens of focal length 20 cm produces an image half in size of the real object. The distance of the real object is

A) 20 cm B) 30 cm C) 10 cm D) 60 cm

**Explanation**

Given: $f = -20\ cm\ , h' = \frac{1}{2}h$ , required is u = ?

$$m = \frac{h'}{h} = \frac{h'}{2h'} = \frac{1}{2} = 0.5$$

$$m = -\frac{v}{u}\ ,\quad \frac{1}{2} = -\frac{v}{u}\ ,\quad v = -\frac{1}{2}u$$

$$\frac{1}{f} = \frac{1}{u} + \frac{1}{v}\ ,$$

$$\frac{1}{u} = \frac{1}{f} - \frac{1}{v} = -\frac{1}{20} + \frac{1}{\frac{u}{2}} = -\frac{1}{20} + \frac{2}{u}$$

$$\frac{1}{u} - \frac{2}{u} = -\frac{1}{20}$$

$$-\frac{1}{u} = -\frac{1}{20}$$

$$u = 20\ cm$$

31. What is the number of images formed by an object placed between two plane mirrors inclined at $30^o$?

A) 10 B) 11 C) 12 D) 12

- ✓ Number of image $= \frac{360^\circ}{\theta} - 1 \;\; if \;\; \frac{360^\circ}{\theta} \; is \; even \;\; or$
- ✓ Number of image $= \frac{360^\circ}{\theta} \;\; if \;\; \frac{360^\circ}{\theta} \; is \; odd$
- ✓ Number of image $= \frac{360^\circ}{30^\circ} = 12 \; which \; is \; even$
- ✓ Therefore, Number of image = 12 – 1 =11

32. Two beams of red and violet colors are made to pass separately through a prism (angle of the prism is 60°).In the position of minimum deviation, the angle of refraction will be

A) 30° for both the colors C) greater for the violet color

B) greater for the red color D) equal but not 30° for both the colors

33. The image formed by a magnifying glass is

A) virtual, erect, and magnified C) Real, inverted, and magnified

B) virtual, inverted, and diminished D) Real, erect, and diminished

34. An object 2 cm high is placed 4 cm from a convex mirror. If the focal length of the mirror is 4 cm, what is the position of image, size of the image and magnification of mirror respectively?

A) 2 cm behind mirror, -2 cm and - 0.5 C) 2 cm in front of mirror,1cm and 0.5

B) 2 cm in front of mirror, 2 cm and - 0.5 D) 2 cm behind mirror, 1 cm and 0.5

Given: $h = 2cm, u = 4cm\,, f = -4cm$

$\frac{1}{v} = \frac{1}{f} - \frac{1}{u} = -\frac{1}{4} - \frac{1}{4} = -\frac{2}{4} = -\frac{1}{2}$ ,

$v = -2cm$ , image is 2cm behind mirror

$m = -\frac{v}{u} = -\left(\frac{-2\ cm}{4\ cm}\right) = 0.5$ This shows image is erect

$m = \frac{h'}{h} = \frac{1}{2}$ , $h' = \frac{1}{2}h = 1\ cm$ .This shows image is diminished

35. A student has difficulty reading the blackboard while sitting in the last row. What could be the defect the child is suffering from? How can it be corrected?

A) The student has Hypermetropia. It can be corrected by concave lens.

B) The student has Hypermetropia. It can be corrected by convex lens.

C) The student has Myopia detect. It can be corrected by concave lens.

D) The student has Myopia detect. It can be corrected by convex lens

36. Light ray is allowed to enter from air medium ($n_1$=1) into the water medium ($n_2$=4/3) at angle of 30° with the normal to air - water boundary. Which one of the following is **not** correct about the ray of light? (sin30° =0.5, cos30° = 0.86)

A) The sine of the angle of incidence of light ray in air is equal to 0.5

B) The sine of the angle of refraction of light ray in water is equal to 0.38

C) The speed of light ray in air is 1.33 times that of its speed in water

D) The speed of light ray in air is 0.75 times that of its speed in water

**Explanation**

use $n_1 sin\theta_1 = n_2 sin\theta_2$ and $\frac{n_2}{n_1} = \frac{v_1}{v_2}$

37. A convex lens produces a virtual image which is four times larger than the object. The image is 15 cm from the lens. What is the focal length of the lens

A) 5 cm B) – 5 cm C) 1/5 cm D) – 1/5 cm

**Explanation**

**Given** $h' = 4h$ , $v = -15\ cm$. required is f =?

$$m = \frac{h'}{h} = \frac{4h}{h} = 4 \qquad m = -\frac{v}{u} = 4, \qquad v = -4u$$

$$u = -\frac{1}{4} \times (-15\ cm) = \frac{15}{4} cm$$

$$\frac{1}{f} = \frac{1}{u} + \frac{1}{v} = \frac{1}{u} - \frac{1}{4u} = \frac{3}{4u}$$

$$f = \frac{4u}{3} = \frac{4}{3} \times \left(\frac{15}{4} cm\right) = 5cm$$

38. An object of size 7.0 cm is placed at 27 cm in front of a concave mirror of 18 cm focal length. Size of image is

A) 4 cm, B) 14 cm C) – 4 cm D) -14 cm

Given $h = 7cm,\ \ f = 18\ cm\ \ and\ u = 27\ cm$

$$\frac{1}{v} = \frac{1}{f} - \frac{1}{u}, \qquad v = 54\ cm$$

$$m = \frac{h'}{h} = -\frac{v}{u} \quad , \quad h' = -\frac{hv}{u} = -14\ cm$$

39. To form a diminished image with a convex lens, the object must be placed:

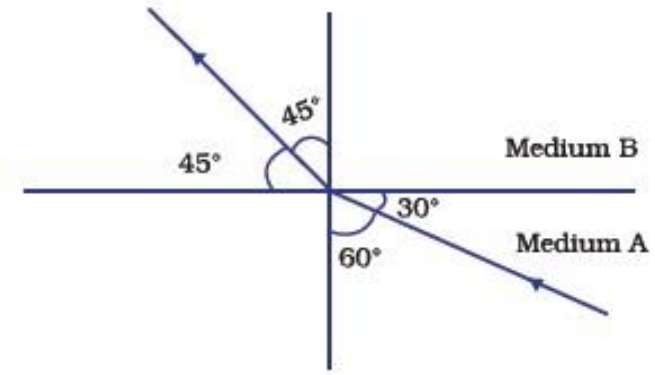
A) Between F and optical center.
B) Between $F_1$ and $2F_1$.
C) Exactly at the focus ($f_2$).
D) Beyond $2F_1$

| Position of the object | Position of the image | Size of the image | Nature of the image |
|---|---|---|---|
| At infinity | At the focus $F_2$ | Highly diminished, point-sized | Real and inverted |
| Beyond $2F_1$ | Between $F_2$ and $2F_2$ | Diminished | Real and inverted |
| At $2F_2$ | At $2F_2$ | Same size | Real and inverted |
| Between $F_1$ and $2F_1$ | Beyond $2F_2$ | Enlarged | Real and inverted |
| At Focus $F_1$ | At infinity | Infinitely large or Highly enlarged | Real and inverted |
| Between focus $F_1$ and optical center O | On the same side of the lens as the object | Enlarged | Virtual and erect |

40. The given figure shows a ray of light as it travels from medium A to medium B.

Refractive index of the medium B relative to medium A is:

A) $\frac{\sqrt{3}}{\sqrt{2}}$
B) $\frac{\sqrt{2}}{\sqrt{3}}$
C) $\frac{\sqrt{2}}{2}$
D) $\frac{1}{\sqrt{3}}$




$$\frac{n_B}{n_A} = \frac{sin\theta_A}{sin\theta_B} = \frac{\sin 60°}{\sin 45°} = \frac{\frac{\sqrt{3}}{2}}{\frac{\sqrt{2}}{2}} = \frac{\sqrt{3}}{2} \times \frac{2}{\sqrt{2}} = \frac{\sqrt{3}}{\sqrt{2}}$$

41.Choose the **wrong** statement for Electromagnetic wave. They

A) are transverse wave

B) travel in vacuum with the speed of light

C) are produced by accelerated charges

**D) travel with the same speed in all medium**

42._____ is of the reflection of light rays when they fall on a smooth surface such as mirror, where the incident rays are reflected in one direction.

A) specular reflection C) diffuse reflection

B) Regular refraction D) Irregular refraction

**Explanation**

- ✓ Specular (regular) reflection takes place when parallel rays fall on a surface and they leave the object as parallel rays.
- ✓ Diffuse (irregular) reflection takes place when parallel rays are reflected in different directions.

43.Which pair of colors does NOT combine to make the correct secondary colors?

A) Red + Blue = Magenta C) Red + Green = Yellow

B) Blue + Green = Cyan D) Red + Yellow = Green

44.A white light is shined through a yellow filter, and then a magenta filter. What color will appear?

A) Blue B) Green C) Red D) Black

**Explanation**




**Figure 6.41** Color subtraction using yellow and magneta filters.

45. The cover of Grade 10 physics book appears to have a magenta color. What colors does it absorb?

A) Blue B) Red C) Green D) Yellow

46. Subtractive synthesis occurs by mixing the basic material colors (cyan, magenta and yellow). Which one of the following is not true when these subtractive colors are mixed?

A) Yellow + magenta = red C) magenta + cyan = blue

B) Yellow + cyan = green D) magenta + cyan + yellow = white

Subtractive synthesis occurs by mixing the basic material colors (cyan, magenta and yellow). If all three colors are mixed, a black color is created. They are mixed with: yellow + magenta = red, yellow + cyan = green, magenta + cyan = blue.

47. If we subtract blue color from magenta, which color we gate?

A) Red B) Blue C) Green D) Black

48. One of the following is not application that are use Color addition principles?

A) Color television C) Color computer monitors

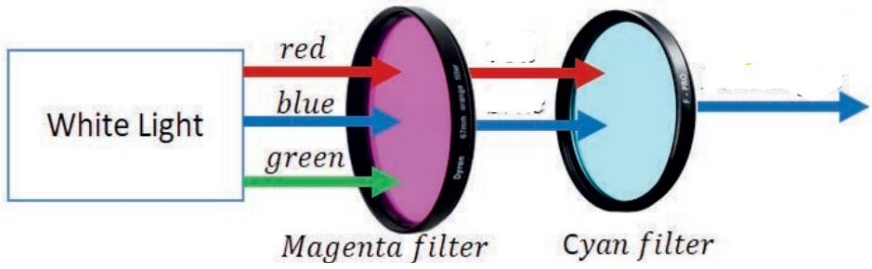
B) On-stage lighting at the theaters. D) Painting and printing

49. The complementary color of blue is

A) Magenta B) Cyan C) Yellow D) Green

- ❖ Complimentary colors are the colors that are absorbed by the subtractive primaries.
- ✓ Cyan's complement is red;
- ✓ magenta's complement is green; and
- ✓ yellow's compliment is blue

50. When magenta filter and cyan filter is used to filter white light as shown.




Which color is reflected from this combination?

A) Red B) Blue C) Green D) Black