King Saud University
College of Applied Studies
and Community Service
Department of Natural Sciences

Midterm Exam II
Physics (PHYS 111)
1437/1438

Name	
Student's ID	
Signature	

Instructions

1. Please print your name and ID number clearly on the page.
2. Problem will be graded on reasoning and intermediate steps as well as on the final answer.
3. Each question is worth 1 point.
4. Try to be neat! Check your answers to see that they are the right order of magnitude.
5. You are allowed using a calculator.
6. The constants and formula are on the sheet of exam (page 2).
7. The exam lasts exactly 90 minutes.

/20

Useful Formula and Constants

$f = (½)\ R$	$d \sin\theta = m\lambda$	$y_{bright} = (\lambda L/d)\ m$
$d \sin\theta = (m + ½)\ \lambda$	$y_{dark} = (\lambda L/d)\ (m+1/2)$	$p = \hbar k = \frac{h\nu}{c} = \frac{h}{\lambda}$
$2nt = (m+1/2)\lambda$	$2nt = m\lambda$	$n_1 \sin\theta_1 = n_2 \sin\theta_2$
$E = hf = hc/\lambda$	$\lambda = c/f$	$\sin\theta_c = n_2/n_1$
$\frac{1}{f} = \frac{1}{d_o} + \frac{1}{d_i}$		$n = c/v$

$C = 3 \times 10^{8}$ m/s

$h = 6.63 \times 10^{-34}$ J.s

$m_e = 9.11 \times 10^{-31}$ kg

$n_{air} = 1$

$n_{water} = 1.33$

Questions (1) : Please choose the **ONE** correct answer.

1. **Einstein purposed that light :**

a) has a particle-like nature by explaining the photoelectric effect

b) has a wave-like nature by explaining the interference phenomenon

c) consists of small parts called photons

d)energy connected with the frequency

2. **The color of visible light that has the lowest energy is**

a) Red b) Yellow c) Violet d) Blue

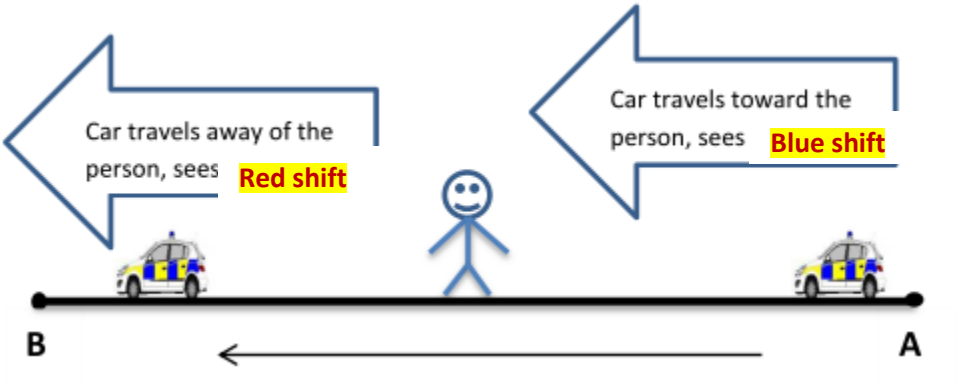
3. **The momentum of 632 nm wavelength is**

a) 120 $\times 10^{-27}$ J.s/m b) 1.05 $\times 10^{-27}$ J.s/m c) 10^{-28}J.s/m d) 22×10^{-27} J.s/m

4. **The energy of light that has a frequency of 5.38 $\times 10^{16}$ Hz is**

a) 3.56×10^{-17} J b) 500×10^{-17} J c) 66×10^{-11} J d) 7.66×10^{-17} J

5. **The observed wavelength of any wave depends on the relative motion of the light source and the receiver of the light. Suppose there is a police car travels from A to B. Determine the type of light shift that observed by a person in the middle of the way.**



6. **The image formed by a plane mirror is always_____.**

a) real and upright b) virtual and upright c) real and inverted d) virtual and inverted

7. When light is incident on a smooth shiny surface_____reflection takes place.

a) specular b) irregular c) diffused d) normal

8. When light travels from a medium which has high refracted index to a medium of low refracted index, the speed of light

a) increase b) decrease c) does not change d) s t o p

9. The magnification equation of mirrors and lens as the relation between

a) the object height and its image height b) the object distance and image distance c) the focal length and the curvature d) a and b

10. The angle of incidence at a plane mirror is 60º. The angle of reflection is

a) 12.5º b) 60º c) 30º d) 15º

11. The radius of a concave mirror is 15 cm. What is its focal length?

a) 15 cm b) 30 cm c) 7.5 cm d) 45 cm

12. A concave mirror used to have an image 3 times larger than the object. Where will be the image created when the object distance at 20 cm?

a) -20 cm behind the mirror b) 20 cm in front of the mirror c) -60 cm behind the mirror d) 60 cm in front of the mirror

13. A concave lens is called_____.

a) converging lens b) diverging lens c) refracting lens d) both converging and diverging lens

14. An object is placed 10 cm from a convex lens whose focal length is 8 cm. The image distance is

a) 50 cm b) 60 cm c) 40 cm d) 10 cm

15. A converging lens could form

a) vrtual image b) real image c) virtual and real images d) perfect image

16. What is the refractive index of the glass when the speed of light in a certain glass is 1.91 x 10^8 m/s.

a) 1.57 b) 0.64 c) 1.09 d) 4.9

17. The critical angle for light passing from a block of quartz into air is 43.24°. Calculate the index of refraction of the block of quartz where the refraction index for air is 1.

a) 1 b) 0.65 c) 0.025 d) 1.46

18. Interference of light was firstly demonstrated by----------, and he used double slits barrier to produce ----------.

a) Max Planck b) Einstein c) De Broglie d) Thomas Young

a) Monochromatic sources b) coherent sources c) polarized sources d) a and b

19. Light of wavelength 500 nm falls on a double-slit spaced 0.05 mm apart. Determine the position of the second order bright fringe (m=2) from the center of a screen placed at 2 m?

a) 5 m b) 0.004 m c) 0.01 m d) 0.04 m

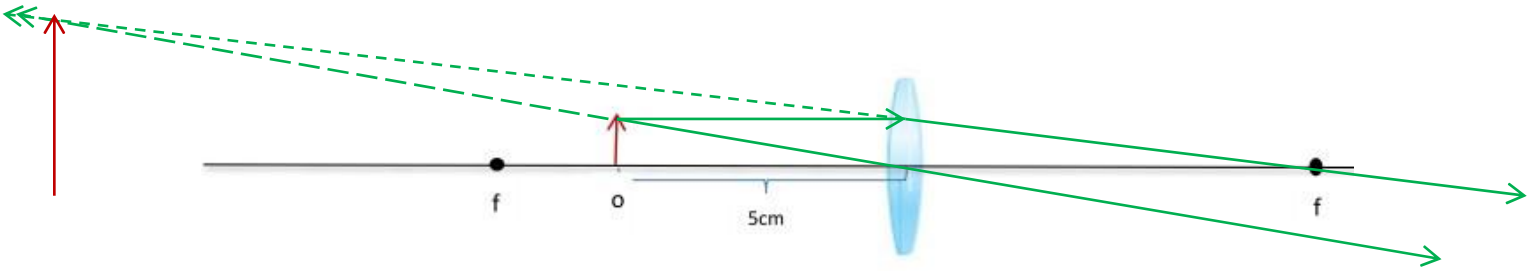
20. A double-slit source is 0.02 mm a part produces an interference pattern on a screen. What is the wavelength of the first-order dark fringe (m=1) seen at an angle of 10 degree.

a) 0.26 μm b) 50 μm c) 2.3 μm d) 0.77 μm

Question (2):

A 2 cm height object is placed 5 cm from a convex lens whose focal length is 7 cm.

a) Sketch the ray diagram.
b) Find the location of the image and its size.
c) Calculate the lens magnification
d) Determine the characteristics of the image.



b) $1/f = 1/d_o + 1/d_i$

$1/7 = 1/5 + 1/d_i$, $1/d_i = 1/7 - 1/5 = -2/35$, $d_i = -17.5$ cm then the image created in front of the lens

$H_i/h_o = - d_i/d_o$, $h_i = h_o (- d_i/ d_o)$, $h_i = (2) (- (-17.5)/(5) = 7$ cm

c) $M = - d_i/ d_o = - (-17.5)/(5) = +3.5$

d) the image is upright (since M is positive), then virtual, and larger (since M is greater than 1)