Review Test
Waves, Light, and Modern
June 2008

Name_____

This year there were 22 of 85 possible credits or about 26 % of test

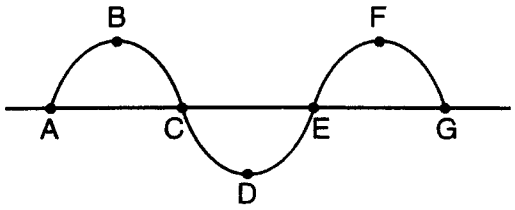
25 The time required for a wave to complete one full cycle is called the wave's

(1) frequency
(2) period
(3) velocity
(4) wavelength

26 An electromagnetic AM-band radio wave could have a wavelength of

(1) 0.005 m
(2) 5 m
(3) 500 m
(4) 5 000 000 m

27 The diagram below represents a transverse wave.



The wavelength of the wave is equal to the distance between points

(1) *A* and *G*
(2) *B* and *F*
(3) *C* and *E*
(4) *D* and *F*

28 When a light wave enters a new medium and is refracted, there must be a change in the light wave's

(1) color
(2) frequency
(3) period
(4) speed

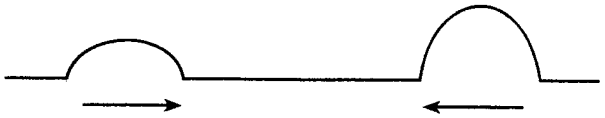
29 The speed of light in a piece of plastic is 2.00×10^8 meters per second. What is the absolute index of refraction of this plastic?

(1) 1.00
(2) 0.670
(3) 1.33
(4) 1.50

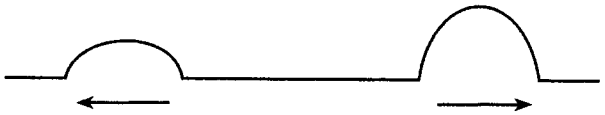
30 Wave *X* travels eastward with frequency *f* and amplitude *A*. Wave *Y*, traveling in the same medium, interacts with wave *X* and produces a standing wave. Which statement about wave *Y* is correct?

(1) Wave *Y* must have a frequency of *f*, an amplitude of *A*, and be traveling eastward.
(2) Wave *Y* must have a frequency of 2*f*, an amplitude of 3*A*, and be traveling eastward.
(3) Wave *Y* must have a frequency of 3*f*, an amplitude of 2*A*, and be traveling westward.
(4) Wave *Y* must have a frequency of *f*, an amplitude of *A*, and be traveling westward.

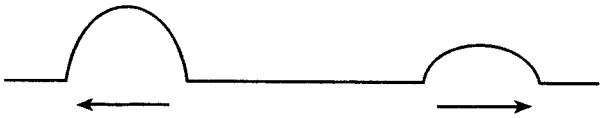
31 The diagram below represents two pulses approaching each other from opposite directions in the same medium.



Which diagram best represents the medium after the pulses have passed through each other?



(1)



(2)

(3)

(4)

32 A car's horn is producing a sound wave having a constant frequency of 350 hertz. If the car moves toward a stationary observer at constant speed, the frequency of the car's horn detected by this observer may be

(1) 320 Hz
(2) 330 Hz
(3) 350 Hz
(4) 380 Hz

33 A mercury atom in the ground state absorbs 20.00 electronvolts of energy and is ionized by losing an electron. How much kinetic energy does this electron have after the ionization?

(1) 6.40 eV
(2) 9.62 eV
(3) 10.38 eV
(4) 13.60 eV

34 Which fundamental force is primarily responsible for the attraction between protons and electrons?

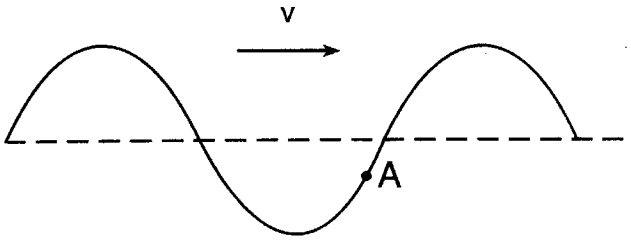
(1) strong
(2) weak
(3) gravitational
(4) electromagnetic

35 The total conversion of 1.00 kilogram of the Sun's mass into energy yields

(1) 9.31×10^2 MeV
(2) 8.38×10^{19} MeV
(3) 3.00×10^8 J
(4) 9.00×10^{16} J

Part B

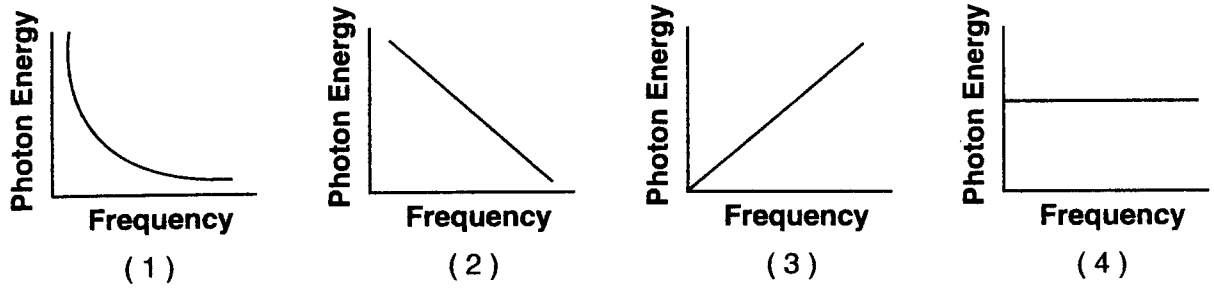
48 The diagram below represents a transverse wave traveling to the right through a medium. Point *A* represents a particle of the medium.



In which direction will particle *A* move in the next instant of time?

(1) up
(2) down
(3) left
(4) right

49 Which graph best represents the relationship between photon energy and photon frequency?



Base your answers to questions 50 and 51 on the table below, which shows data about various subatomic particles.

Subatomic Particle Table

Symbol	Name	Quark Content	Electric Charge	Mass (GeV/c^2)
p	proton	uud	+1	0.938
$\bar{p}$	antiproton	$\bar{u}\bar{u}\bar{d}$	−1	0.938
n	neutron	udd	0	0.940
λ	lambda	uds	0	1.116
Ω^-	omega	sss	−1	1.672

50 Which particle listed on the table has the opposite charge of, and is more massive than, a proton?

(1) antiproton
(2) neutron
(3) lambda
(4) omega

51 All the particles listed on the table are classified as

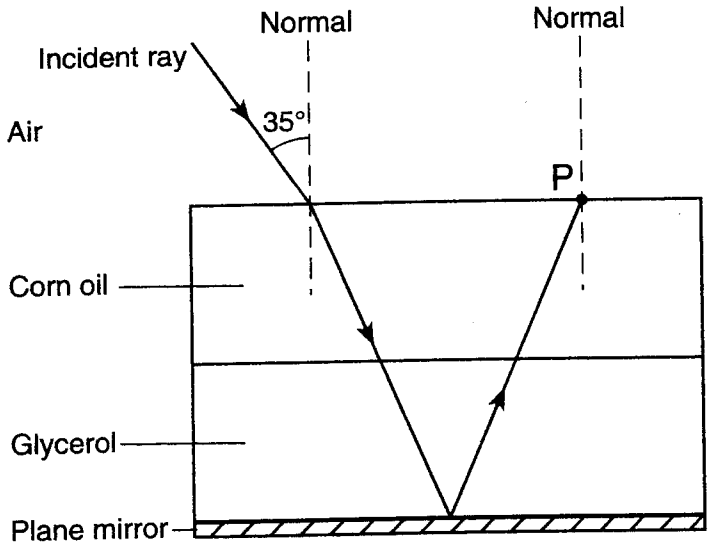
(1) mesons
(2) hadrons
(3) antimatter
(4) leptons

61 The diagram in your answer booklet represents a transverse wave moving on a uniform rope with point *A* labeled as shown. On the diagram *in your answer booklet,* mark an **X** at the point on the wave that is 180° out of phase with point *A*. [1]

Part C

Base your answers to questions 72 through 74 on the information and diagram below.

A ray of monochromatic light having a frequency of 5.09×10^{14} hertz is incident on an interface of air and corn oil at an angle of 35° as shown. The ray is transmitted through parallel layers of corn oil and glycerol and is then reflected from the surface of a plane mirror, located below and parallel to the glycerol layer. The ray then emerges from the corn oil back into the air at point *P*.



72 Calculate the angle of refraction of the light ray as it enters the corn oil from air. [Show all work, including the equation and the substitution with units.] [2]

73 Explain why the ray does *not* bend at the corn oil-glycerol interface. [1]

74 On the diagram *in your answer booklet,* use a protractor and straightedge to construct the refracted ray representing the light emerging at point *P* into air. [1]

Base your answers to questions 75 and 76 on the information and data table below.

In the first nuclear reaction using a particle accelerator, accelerated protons bombarded lithium atoms, producing alpha particles and energy. The energy resulted from the conversion of mass into energy. The reaction can be written as shown below.

$$^{1}_{1}H + ^{7}_{3}Li \rightarrow ^{4}_{2}He + ^{4}_{2}He + \text{energy}$$

Data Table

Particle	Symbol	Mass (u)
proton	$^{1}_{1}H$	1.007 83
lithium atom	$^{7}_{3}Li$	7.016 00
alpha particle	$^{4}_{2}He$	4.002 60

75 Determine the difference between the total mass of a proton plus a lithium atom, $^{1}_{1}H + ^{7}_{3}Li$, and the total mass of two alpha particles, $^{4}_{2}He + ^{4}_{2}He$, in universal mass units. [1]

76 Determine the energy in megaelectronvolts produced in the reaction of a proton with a lithium atom. [1]

Answer Sheet
Waves Light & Modern
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Name _____

25 _____
26 _____
27 _____
28 _____
29 _____

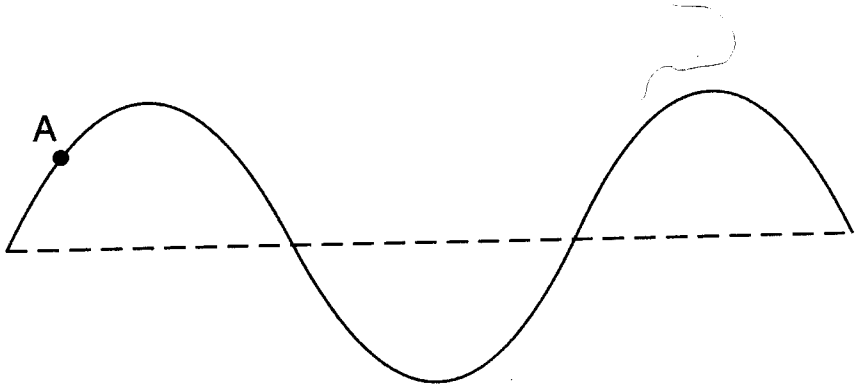
30 _____

31 _____
32 _____
33 _____
34 _____
35 _____

Part B

48 _____
49 _____
50 _____
51 _____

61

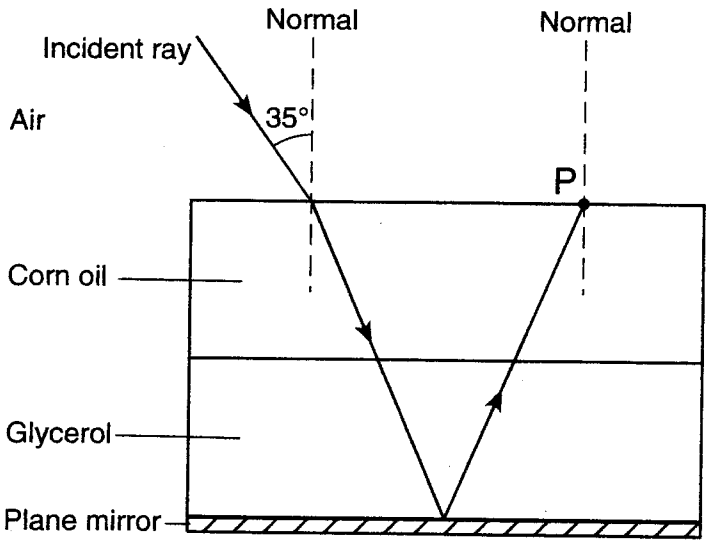


72

73 _____

_____

74



75 $M =$ _____ u

76 Energy = _____ Mev

Answer Sheet
Waves Light & Modern
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Name Answer Key

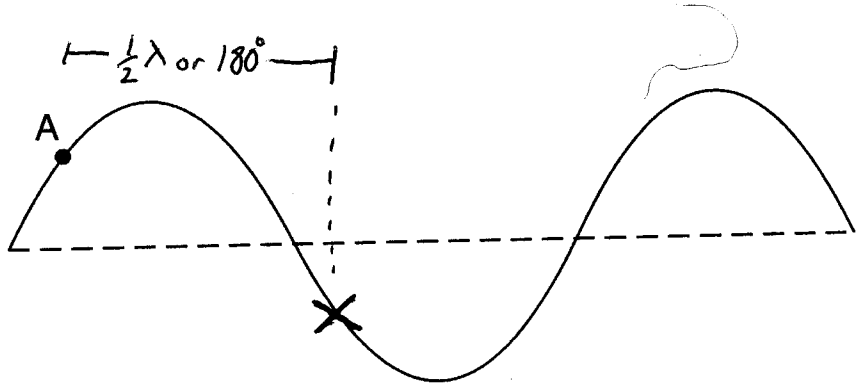
25 2
26 3
27 2
28 4
29 4
30 4

31 2
32 4
33 2
34 4
35 4

Part B

48 2
49 3
50 4
51 2

61



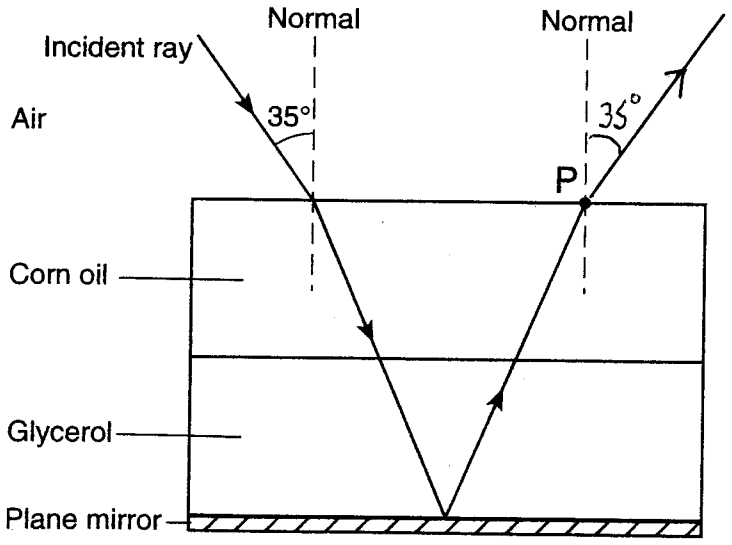
72 $n_1 \sin\theta_1 = n_2 \sin\theta_2$

$1 \sin 35° = 1.47 \sin\theta_2$

$\theta_2 = 23°$

73 They both have same n number or same index

74



75 $M = .01863$ u

76 Energy = 17.3 Mev

Credits of 22

%

# of 85

Scaled Regents Score

22	100.0	85.0	100
21	95.5	81.1	96
20	90.9	77.3	93
19	86.4	73.4	89
18	81.8	69.5	86
17	77.3	65.7	83
16	72.7	61.8	79
15	68.2	58.0	75
14	63.6	54.1	71
13	59.1	50.2	68
12	54.5	46.4	63
11	50.0	42.5	59
10	45.5	38.6	56
9	40.9	34.8	51
8	36.4	30.9	46
7	31.8	27.0	41
6	27.3	23.2	36
5	22.7	19.3	30
4	18.2	15.5	26
3	13.6	11.6	20