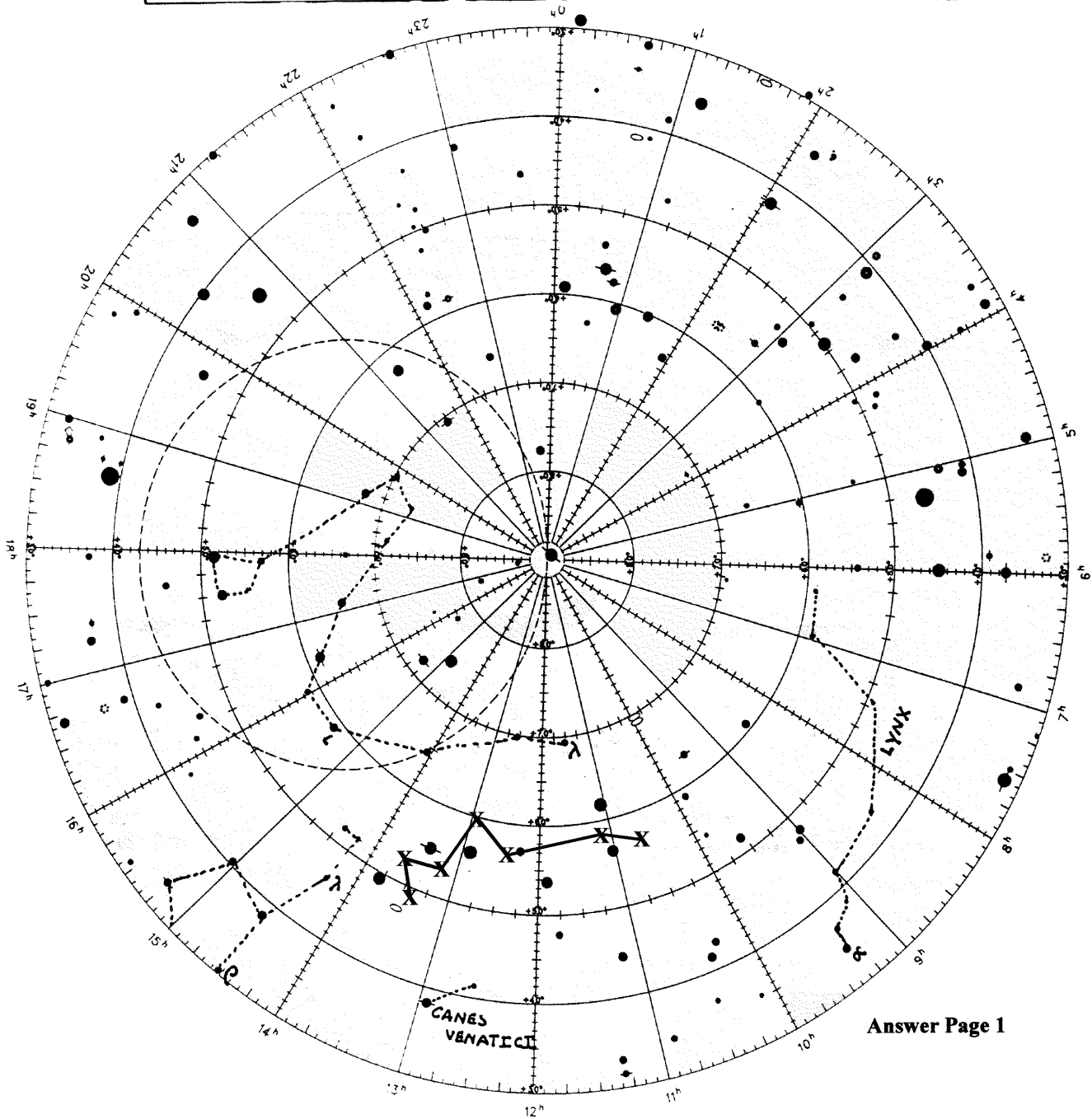


Answer Pages
Question A, parts (a) and (b)

Star in Ursa Major	Proper Motion ("/year)	Direction of Motion	Motion in 100,000 years (degrees)
Alpha (α)	0.138	α Lyncis	3.833
Beta (β)	0.088	λ Draconis	2.444
Gamma (γ)	0.093	ι Draconis	2.583
Delta (δ)	0.106	ι Draconis	2.944
Epsilon (ϵ)	0.113	ρ Bootis	3.139
Zeta (ζ)	0.127	λ Bootis	3.528
Eta (η)	0.123	α Canum Venaticorum	3.417



Question A:

c) Image 1

Name M13
RA/Dec 16^h45^m+38⁰
Constellation Hercules

Image 2

Name M57 or Ring Nebula
RA/Dec 18^h50^m+33⁰
Constellation Lyra

Image 3

Name Andromeda Galaxy or M31
RA/Dec 0^h40^m+42⁰
Constellation Andromeda

d) Star Name Deneb

Constellation Name Cygnus

e) Specific Star Type Cepheid Variable

Periodicity 16 days (+ or - 5 days)

Magnitude at Maxima +5.9

Magnitude at Minima +7.3

Distance from Earth 352 ly (108 pc)

f) Epoch Correct? Why? yes - data centered on zero

g) Period Changing? yes

h) Between Cycle 0 and 45 unchanging

Between Cycle 45 and 60 period shortens

Between Cycle 60 and 110 period lengthens

Between Cycle 110 and 190 period shortens

i) Slope Information rate of change of period

Question B:

a) Velocity and Direction of System 43km/s away from Earth

b) Orbital Velocity of Star A 75.4 km/s

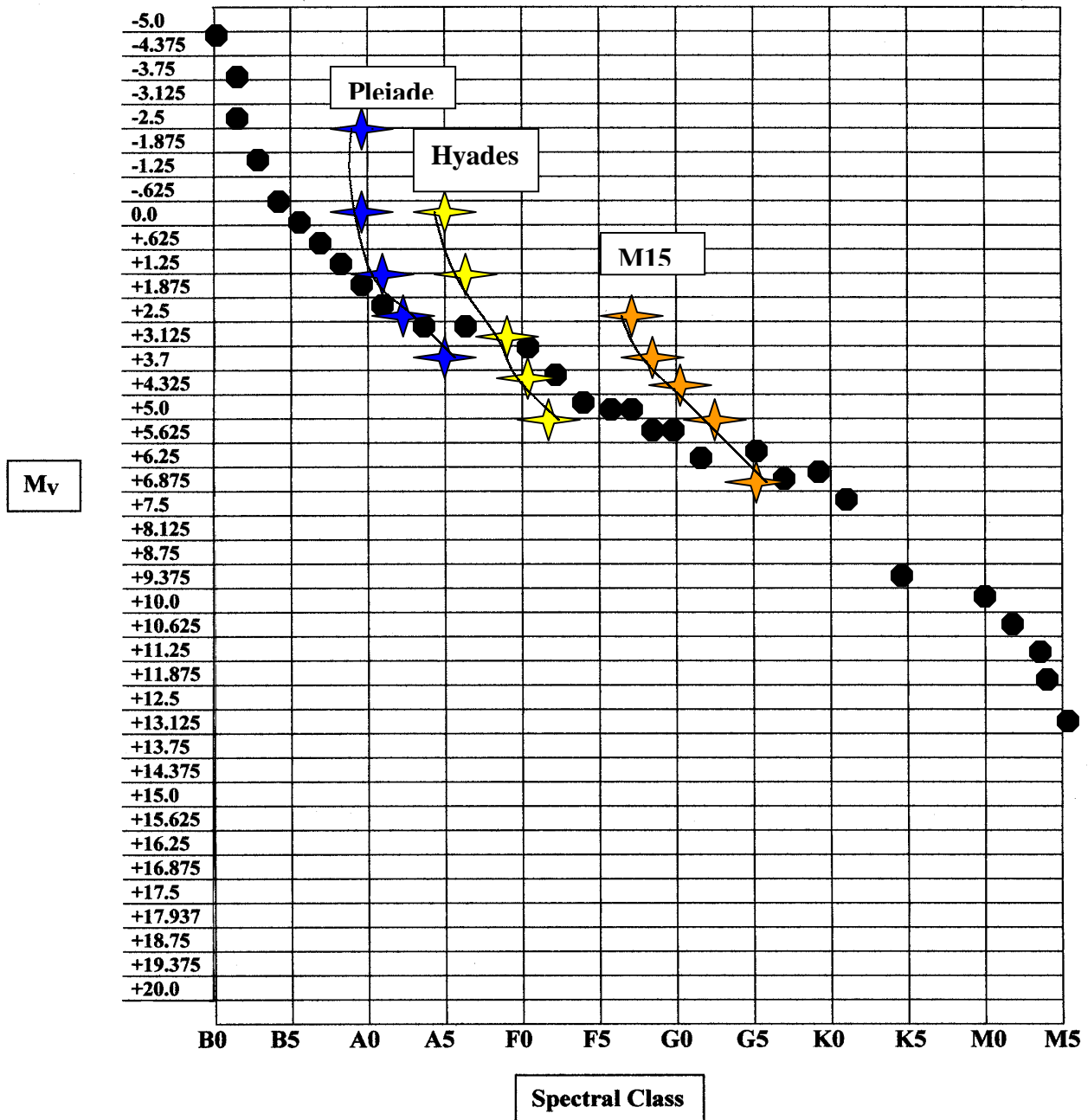
Orbital Velocity of Star B 16.0 km/s

Distance Between Star A and Star B 0.73 AU

c) Mass of Star A 2.21 solar masses

Mass of Star B 4.42 solar masses

H-R Diagram



NOTE: these plots are only an approximation of the actual plot due to the limitations of the process used to generate the above graph.

Question C:

a) Plotted on H-R diagram on Answer Page 3

b) Age of Pleiades 500×10^6 yrs (youngest) _____

Age of Hyades 1×10^9 yrs (next-to-youngest) _____

Age of M15 3×10^9 yrs (oldest) _____

c)	Pleiades	Hyades	M15
Coordinates:	$3^h 45^m + 25^0$	$4^h 30^m + 17^0$	$21^h 30^m + 12^0$
Type:	open cluster	open cluster	globular cluster
Location:	spiral arms	spiral arms	halo

Why Does Calculated Age Support Cluster Type? _____

_____ open clusters are younger than globular clusters _____

Question D:

a) Image 15 Constellation Orion

Object 1: Image # 12 Name Orion Nebula

Object Type star-forming region (nebula) RA/Dec $5^h 30^m - 5^0$

Object 2: Image 3 Name Betelgeuse

Object Type Red Supergiant RA/Dec $5^h 52^m + 7^0 24^m$

Object 3 (Betelgeuse) Produces Light Curve 5

b) Image 19 Event SN1987 or supernova event

Over Time Images 9 and 22 (or 21)

Galaxy Name Large Magellanic Cloud Galaxy Image # 1

c) Image 7 RA/Dec $18^h 17^m - 13^0 47'$

Other Image Within this Object 8 Type Stellar Nursery

d) Image located in Cygnus: Name CYG X-1

Number 14 Type of Object Black Hole or X-ray binary

e) Image 17 Object Crab Nebula Constellation Taurus

Image Number for Object 4 Type of Object Pulsar

Other Image Number 6 or 18 Name Pleiades or Hyades

f) supernova, black holes, pulsars

g) 6 – Pleiades, 10 – M15, 11 – M13, 18 – Hyades

h) RA/Dec of Object in Image 13 $2^h 21^m + 16^0$

Distance Determined From Image 20