Name: _____

Preliminary Physics

Lesson 6 & 7
Cosmic Engine

In Homework. This booklet is your best friend.

Summary of Key Words

Account
Account for: state reasons for, report on. Give an account of: narrate a series of events or transactions

Analyse
Identify components and the relationship between them; draw out and relate implications

Apply
Use, utilise, employ in a particular situation

Assess
Make a judgement of value, quality, outcomes, results or size

Calculate
Ascertain/determine from given facts, figures or information

Clarify
Make clear or plain

Classify
Arrange or include in classes/categories

Compare
Show how things are similar or different

Construct
Make; build; put together items or arguments

Contrast
Show how things are different or opposite

Deduce
Draw conclusions

Define
State meaning and identify essential qualities

Demonstrate
Show by example

Describe
Provide characteristics and features

Discuss
Identify issues and provide points for and/or against

Distinguish
Recognise or note/indicate as being distinct or different from; to note differences between

Evaluate
Make a judgement based on criteria; determine the value of

Examine
Inquire into

Explain
Relate cause and effect; make the relationships between things evident; provide why and/or how

Extract
Choose relevant and/or appropriate details

Extrapolate
Infer from what is known

Identify
Recognise and name

Interpret
Draw meaning from

Investigate
Plan, inquire into and draw conclusions about

Justify
Support an argument or conclusion

Outline
Sketch in general terms; indicate the main features of

Predict
Suggest what may happen based on available information

Propose
Put forward (for example a point of view, idea, argument, suggestion) for consideration or action

Recall
Present remembered ideas, facts or experiences

Recommend
Provide reasons in favour

PART A: MULTIPLE CHOICE

Question 1 (Independent 2005 – Qu 15)

In a particular star both hydrogen and helium are reactants in energy producing reactions. To which group of stars does this star belong?

a) Black holes
b) Main sequence
c) Red giants
d) White dwarfs

Question 2

By studying the spectra of stars, early astronomers realised that stars had individual 'personalities', but could be grouped according to their spectra. The table summarises the characteristics of each group.

Spectral Class	Temperature Range, K	Spectral features	Example
O	Above 25,000	Strong lines of ionised helium. Lines of doubly ionised oxygen, nitrogen and carbon	Delta Cephei
B	25,000 - 11,000	Lines of neutral helium are most prominent. Hydrogen lines stronger than in O class.	Rigel, Spica
A	11,000 – 7,500	Hydrogen lines are most prominent. Singly charged ionised magnesium, silicon, iron, calcium and titanium appear.	Sirius, Vega
F	7,500 – 6,000	Hydrogen lines are weaker than in A class and neutral metal lines (e.g. calcium) are stronger.	Procyon
G	6,000 – 5,000	Lines of ionised calcium are most dominant and hydrogen lines are weak. Lines of many neutral and singly charged metals are visible.	Sun, Capella
K	5,000 – 3,500	Neutral metal lines are most prominent. Molecular bands appear.	Arcturus
M	Below 3,500	Molecular bands are the most common feature with strong titanium oxide bands.	Antares, Betelgeuse

Which star is most likely to be a red giant?

a) Delta Cephei
b) Rigel
c) Sirius
d) Antares

Question 3

Using the information in question 2, answer the following question. Which of the following would help to determine if a white star is a main sequence star or a white dwarf?

a)   Diameter of the star, energy sources, luminosity
b)   Diameter of the star, luminosity, distance from Earth
c)   Diameter of the star, energy source, distance from Earth
d)   Energy source, distance from Earth, luminosity

Question 4

Our sun has a surface temperature of 6000K. The star Antares has a surface temperature of 3400K and a diameter 300 times greater than our Sun. To which group of stars does Antares belong?

a)   Black holes
b)   Nebulae
c)   Red giants
d)   Supernova

Question 5
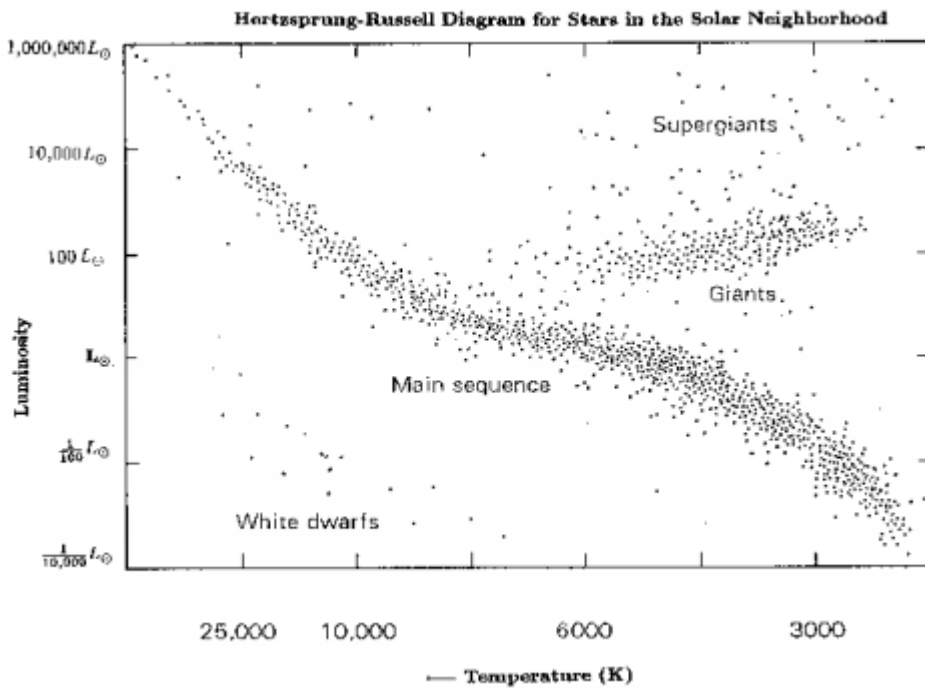
Which of the following stars would have the lowest surface temperature?

a)   Blue giant
b)   Yellow main sequence
c)   White dwarf
d)   Red giant

PART B: SHORT RESPONSE

Question 1 (QAT 2008 – Qu 28)

The Hertzsprung Russell diagram is shown here for the stars in the solar neighbourhood.

a) Identify the most common type of star from those in our nearest neighbourhood. (1 mark)

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b) Name another possible label for the HR diagrams' x-axis apart from the one used here and describe its relationship with temperature. (2 marks)

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c) Compare quantitatively the surface temperature of the Red Giant stars (on average) with that of the White Dwarf stars (on average). (1 mark)

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d) Explain why the Red Giants are different from the White Dwarfs in terms of their surface temperature and energy source. (2 marks)

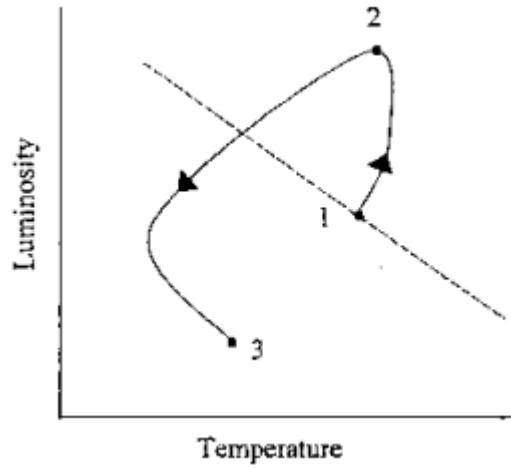--

Question 2 (Independent 2005 – Qu 26)

Draw a Hertzsprung-Russell diagram for main sequence stars, red giants and white dwarfs. Include TWO alternative names for the horizontal axis and one name for the vertical axis. (6 marks)

Question 3 (Independent 2004 – Qu 28)

The diagram shows the three stages in the life of a star similar to our sun.

What type of stars exist at each of the positions 1, 2 and 3 on this diagram, and what is the energy source for each of them? (3 marks)


Question 4

Draw a Hertzsprung-Russell diagram with labelled axes and indicate the regions for main sequence stars, white dwarfs, red dwarfs and blue giants. (4 marks)

Question 5 (Independent 2002 – Qu 28)

The diagram below shows you a cluster of stars found in the galaxy.

a) Using the reference scale and the spectral class place the stars on the Hertzsprung – Russell diagram in their appropriate positions. (1 mark)

Reference Scale

- -2
- 0
- 2
- 4
- 6
- 8
- 10
- 12

"Photo" of a Cluster

λ
δ
μ
α
χ   ν   ε
β
φ
η   I   γ
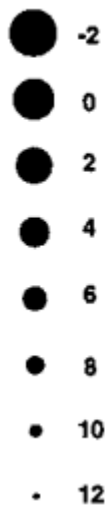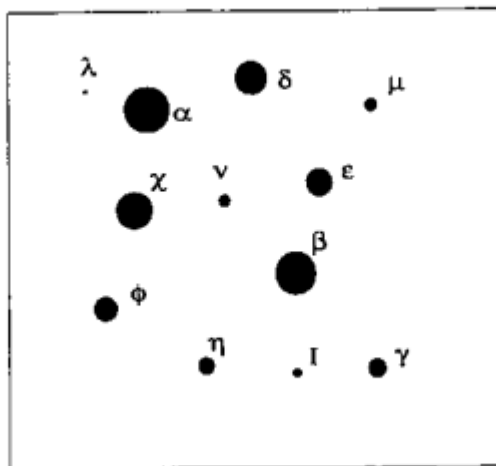
Spectral Class

α K5
β K0
χ G2
δ G7
ε F5
φ G2
γ K2
η K9
I M2
λ M4
μ A10
ν M0

ABSOLUTE MAGNITUDE

-2
0
2
4
6
8
10
12
14

O B A F G K M N

SPECTRAL CLASS

b) Which of the stars in the cluster would be hottest on the surface? Explain your answer. (2 marks)

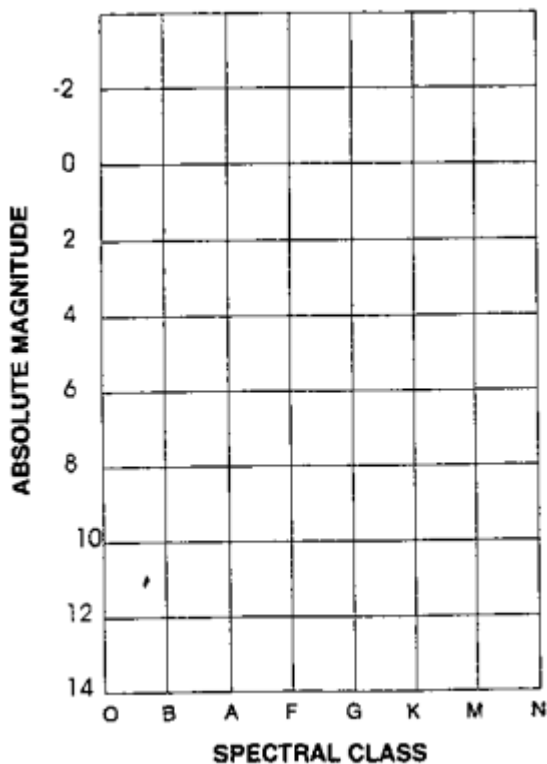

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c) Which of the stars in the cluster are probably the hottest inside? Explain your answer. (2 marks)