Phase Two Bridging Work: Physical Education - Acquisition of Skill

Staff contact Details: Mr Thomas email: Jthomas@chippingnortonschool.org

Introduction to the course	GCSE Flashback	A level subject preparation tasks
Assessment: Link to **PE Syllabus** **30% Coursework** - This is a practically assessed performance in one sport. You are also required to verbally produce an action plan to a live performance. **70% Theory** Three examination papers Link to **Paper 1** Physiological factors affecting performance Link to **Paper 2** Psychological factors affecting performance Link to **Paper 3** Socio cultural factors affecting performance **OCR A Level PE Text book** Hodder Education ISBN 978-1-5104-7331-7 **Revision Guide: My Revision Notes: OCR A Level PE** Hodder Education ISBN: 978-1510405219	Link to Knowledge Organiser - Videos to watch: Topic 1 Classification of skills Video to recap (watch only the first 36 minutes) Topic 2 Guidance Video to recap (15 minutes long) Topic 3 Feedback Video to recap (11 minutes long) Quiz Kahoot Quiz number 1 (20 questions) Kahoot Quiz number 2 (40 questions)	**For your chosen sport:** Produce a PP presentation (or equivalent) to include - ● A table classifying the 5 most common skills used in the sport e.g, passing, catching, shooting ● Explain the 4 types of guidance and how they could be used to teach each of the chosen skills from above ● Explain the different types of feedback that could be used to improve each of the 5 skills You must include - ● Where you would place the skills on the environmental, difficulty, pacing, muscular involvement, continuity and organisational continuum. ● A description of the 4 types of guidance and an example for each of your 5 chosen skills ● A list of the types of feedback and examples of how they could be used in your sport. See a model example here DEADLINE FRIDAY 10TH JULY

Phase Two Bridging Work: Physical Education - Sport and Society

Staff contact Details: Mr Trainer email: Atrainer@chippingnortonschool.org

Introduction to the course	**A level subject preparation tasks**
Assessment: Link to **PE Syllabus** **30% Coursework** - This is a practically assessed performance in one sport. You are also required to verbally produce an action plan to a live performance. **70% Theory** Three examination papers Link to **Paper 1** Physiological factors affecting performance Link to **Paper 2** Psychological factors affecting performance Link to **Paper 3** Socio cultural factors affecting performance **OCR A Level PE Text book** Hodder Education ISBN 978-1-5104-7331-7 **Revision Guide: My Revision Notes: OCR A Level PE** Hodder Education ISBN: 978-1510405219	**Sport and Society -** Produce a Case Study report to include - ● History of the Modern Olympic Games ● The Olympic Games - The advantages and disadvantages of being the host city/country. (Sporting, Economic, Social) You must include ● A brief History of the Modern Olympic Games including who the founder was. ½ to 1 side of A4. ● Explain 4 advantages to the host city/country of hosting the Games. 1 side of A4 ● Explain 4 disadvantages to the host city/country of hosting the Games. 1 side of A4 ● In your opinion is hosting the games a good or a bad thing for the host city/country? ½ side A4 Here are some sources, but please feel free to use your own also - History of Modern Olympics Hosting - Benefits and drawbacks (You can click on each point to reveal points and counter points) Benefits of London 2012 The leftover stadiums (White Elephants) DEADLINE FRIDAY 10TH JULY

Phase Two Bridging Work: Physical Education - Applied Anatomy and Physiology

Staff contact Details: Mrs Tandy email: CTandy@chippingnortonschool.org

Introduction to the course	GCSE Flashback	A level subject preparation tasks
Assessment: Link to **PE Syllabus** **30% Coursework** - This is a practically assessed performance in one sport. You are also required to verbally produce an action plan to a live performance. **70% Theory** Three examination papers Link to **Paper 1** Physiological factors affecting performance Link to **Paper 2** Psychological factors affecting performance Link to **Paper 3** Socio cultural factors affecting performance **OCR A Level PE Text book** Hodder Education ISBN 978-1-5104-7331-7 **Revision Guide: My Revision Notes: OCR A Level PE**	**Videos to watch** • Double Pump - https://www.youtube.com/watch?v=owlFyxKd2os • The Heart - https://www.youtube.com/watch?v=2qRDHK_5QqY • The Cardiac Cycle - https://www.youtube.com/watch?v=swGV1a3f1G8 • The Conduction System - https://www.youtube.com/watch?v=NdGmpRXqIk4&list=PLzh4kOin3WAqKL76NpiwuRoLrJDg65K16&index=8&t=0s • Heart Values - https://www.youtube.com/watch?v=J-LoA-0w42c&list=PLzh4kOin3WAqKL76NpiwuRoLrJDg65K16&index=9&t=0s • Heart Rate Response to Exercise - https://www.youtube.com/watch?v=9PD6ESjqVZg • Blood Vessels - https://www.youtube.com/watch?v=bNLN72Ej_5Q • Venous Return - https://www.youtube.com/watch?v=U13TwV1b5bc **Websites to look at (including interactive activities)** • https://www.texasheart.org/heart-health/heart-information-center/topics/anatomy-of-the-heart-and-cardiovascular-system/ • https://www.getbodysmart.com/heart-anatomy **Documents to view** • Blood vessels comparison table	**Cardiovascular System - Tasks** 1. Create a **hand drawn** poster of the Cardiovascular System. **Label** the structures of the heart, major blood vessels, blood types and pathway of blood (use black ink). 2. Using blue ink add the structures of the **Conduction System** onto your poster (from task 1). 3. Create a flow diagram showing how the conduction system **controls** the cardiac cycle. 4. Draw a table that shows Heart Rate, Stroke Volume and Cardiac Output volumes at rest for a **trained** and **untrained athlete**. 5. Add 2 more columns to your table (from task 4 showing Heart Rate, Stroke Volume and Cardiac Output volumes during **sub-maximal** and **maximal** intensity exercise for a **trained** and **untrained** athlete. **Past Paper Questions** • Cardiovascular Past Paper Questions **Past Paper Mark Scheme** • Cardiovascular Past Paper Mark Scheme

Hodder Education ISBN: 978-1510405219		DEADLINE FRIDAY 10TH JULY

Year 12	Key Topics	Practical Examples	Key topics continued

Skill

Be able to justify where the skills lie on continuum: • difficulty (simple/complex) • environmental influence (open/closed) • pacing (self-paced/externally paced) • muscular involvement (gross/fine) • continuity (discrete/serial/continuous) • organisation (low/high).

Open - movements that are affected by the environment / team mates / opponents / surface with lots of decisions to be made.
Closed - Not affected by the environment, they are habitual and follows a technical model.
Self paced - the performer is in control and determines when the movement starts and the rate at which it proceeds
Externally paced - control of the movement is not determined by the performer but by the environment (often the opponent).

Discrete - have a clear beginning and end. To be repeated this single skill must be started again.
Serial - skills that have a number of discrete elements put together in a definite order to make a movement or sequence
Continuous - have no definite beginning or end. The end of one cycle is the start of the next.

1. (simple skill)	One or few stimuli to process / limited information to process/one or few decisions to make / skill with few subroutines / limited cognitive demand / limited perceptual requirements / less feedback / limited decision making
2. (**eg** simple)	Swimming / running / sprinting / sprint start / (closed skills eg) throwing / kicking / jumping (in a closed situation)
3. (complex skill)	Many stimuli to process / lots of information to process / many decisions to make /increased perceptual requirements / more feedback / skill with more or many subroutines
4. (**eg** complex)	Batting or bowling in cricket / basketball dribble / tennis serve / hitting a ball / gymnastics routine / somersault / high jump / triple jump / golf swing (open skills eg) receiving a ball / delivering a pass (in an open situation)

Gross - Involves large muscle movements where there is little concern for precision. Shot put.
Fine - Involves intricate movements using small muscle groups and emphasises hand-eye co-ordination and involves accuracy skill e.g. snooker shot.

Closed-shot put, Open-Pass in football

Self paced-javelin throw. Externally paced, receiving a serve in badminton

Discrete- hockey penalty flick.
Serial-sequence of skills in triple jump.
Continuous-cycling

Types of Practice

Characteristics and uses of each:
• part practice • whole practice • whole/part-whole practice • progressive/part practice • massed practice • distributed practice • fixed practice • varied practice.

Part-practicing the toss up of the ball in tennis. Whole-tennis serve all components. Progressive-part- breast stroke legs then arms. . Massed practice-continuous practice (can be dangerous and cause injury), Distributed practice-long rests e.g. having breaks between basketball drills to play table tennis. Fixed practice-closed.g. badminton players continuously practices the flick serve. Varied-gymnastics dance and game activities.

Transfer

Types of transfer• positive • negative • proactive • retroactive • bilateral • know and under

Positive Transfer	One skill will help the learning and performance of another.	The action of bowling in cricket can help with the learning of a cartwheel in gymnastics.
Negative Transfer	Where one skill has a negative affect on the learning of another.	Learning a forehand clear in badminton won't help a performer with a forehand drive in tennis.

Bilateral transfer- fielding with both hands in cricket

Theories of Learning.

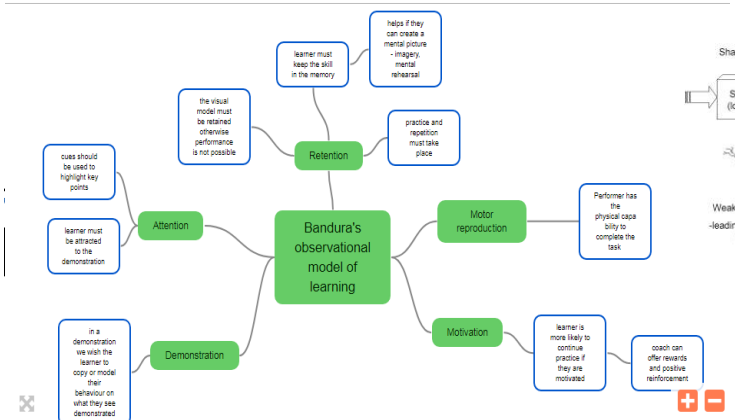
• operant conditioning:
A created environment that will allow a desired response to be performed/achieved. E.g.Putting a wall in place for a learner practising free kicks.
• cognitive theory of learning • Bandura's theory of social/observational learning.

Cognitive learning practical example- a cricketer who learns to swing the ball when bowling by understanding the basic mechanics of this movement.

Stages of learning

Cognitive • Associative • Autonomous.

2 (c)	Identify the three phases of learning movement skills and describe the characteristics of each phase. (6 marks)	Accept	Do not accept
		Phases in any order	
Cognitive (sub max 2)			
1	Cognitive (phase)		
2	Leads to a mental image or picture (being formed) / mental rehearsal / Understanding of what needs to be done		Demonstration
3	Needs (conscious) thought or concentration on technique or sub routines		
4	Unable to use intrinsic or kinaesthetic feedback / only extrinsic feedback effective / reliant on verbal or visual cues / feedback needed		
5	Movement (often) lacks fluency or rhythm/movement jerky / trial and error a feature		Longest phase
Associative (sub max 2)			
6	Associative (phase)		
7	Matching or associating mental model with actual performance		
8	Motor programmes **begin to be** formed		
9	Practice or rehearsal occurs		
10	The following can be used: more detailed feedback / knowledge of results (KR) / knowledge of performance (KP) / kinaesthesis / kinaesthetic or intrinsic feedback / less reliant on extrinsic feedback		
11	(More) trial and error/learn from mistakes / fewer mistakes / more consistent or effective		Start to groove skill
12	Increased fluency or rhythm or efficiency / /movement less jerky / better timing		
13	Some never leave or move beyond this stage		Longest phase
Autonomous (sub max 2)			
14	Autonomous (phase)		
15	Accurate or (well) grooved or consistent or habitual or over learned / motor programmes fully formed (stored in LTM)	Few mistakes / mastered technique	No mistakes / natural / second nature
16	Fluent or rhythmic	effortless	



Key topics continued

Types of guidance

verbal guidance e.g. a swimming teacher describing race tactics• visual guidance e.g. coach demonstrating a lay up. • manual guidance e.g. physically supporting a handstand. • mechanical guidance e.g. use of the hoist in trampolining (back somersault) • advantages and disadvantages of using each type of guidance.

Extrinsic feedback comes from external sources such as

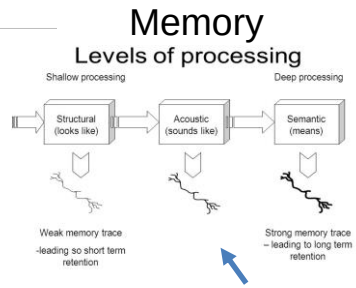
Knowledge of results (KR) is feedback about the result or outcome of the movement

Knowledge of performance is feedback concerning the quality of the movement; KP can be internal as it arises from kinaesthetic awareness

Negative feedback is received when the movement is incorrect.

Intrinsic feedback is a form of sensory feedback about the physical feel of movement

Positive feedback can be given externally by the teacher or coach when the player is praised following success.



Deeper understanding of a skill which is stored in long term memory.

Year 11 Bridging work

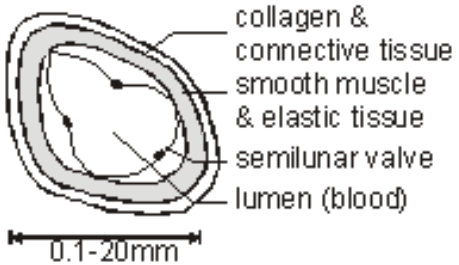
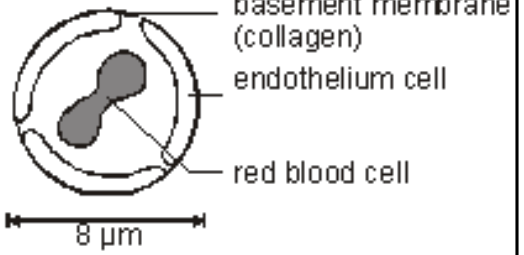
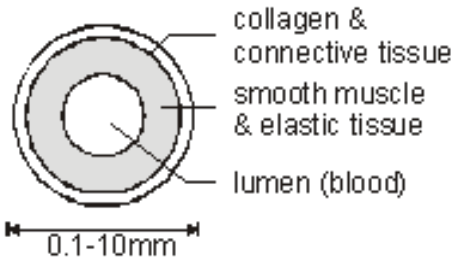
Model answer

Mr Thomas

Chosen skill – passing in football

- Closed skill because it is not dependent on the environment
- Self paced because I perform the skill with the speed and timing of my choice
- Gross because its involves large muscle movements
- Complex because lots of decisions to make
- High organisation because lots of subroutines that are difficult to break down
- Visual guidance when demonstrating how to pass
- Verbal guidance when explaining when to pass
- Manual guidance when striking through to kick the ball
- Feedback types suitable for a pass:

Extrinsic, positive and knowledge or results

Veins and Venules	Capillaries	Arteries and Arterioles
		
Function is to carry blood from tissues to the heart	Function is to allow exchange of materials between the blood and the tissues	Function is to carry blood from the heart to the tissues
Thin walls, mainly collagen, since blood at low pressure	Very thin, permeable walls, only one cell thick to allow exchange of materials	Thick walls with smooth elastic layers to resist high pressure and muscle layer to aid pumping
Large lumen to reduce resistance to flow.	Very small lumen. Blood cells must distort to pass through.	Small lumen
Many valves to prevent back-flow	No valves	No valves (except in heart)
Blood at low pressure	Blood pressure falls in capillaries.	Blood at high pressure
Blood usually deoxygenated (except in pulmonary vein)	Blood changes from oxygenated to deoxygenated (except in lungs)	Blood usually oxygenated (except in pulmonary artery)

1(a).

(i) Give an average value for cardiac output for a performer at rest and during maximal exercise.

[2]

(ii) Describe how the conduction system of the heart controls the systolic phase of the cardiac cycle.

[4]

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(b).

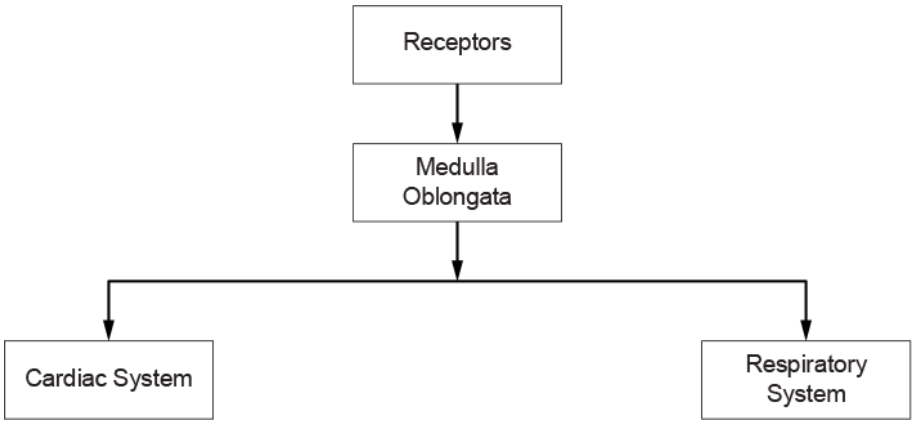

Fig. 2

Describe neural factors which regulate the cardiac and respiratory systems shown in Fig. 2 during exercise.

Using Fig. 2, explain how these systems affect an endurance performer.

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[10]

2. Gravity is one mechanism of venous return which aids the flow of blood back to the heart.

(i) Identify **three** other mechanisms of venous return.

---[3]

(ii) Explain how an increase in venous return during exercise affects the quality of an athlete's performance.

---[3]

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3.

Explain the changes in the distribution of cardiac output from rest to maximal exercise.

Make reference to:

- Vascular shunt mechanisms
- Venous return
- Control by the vasomotor centre

[10]

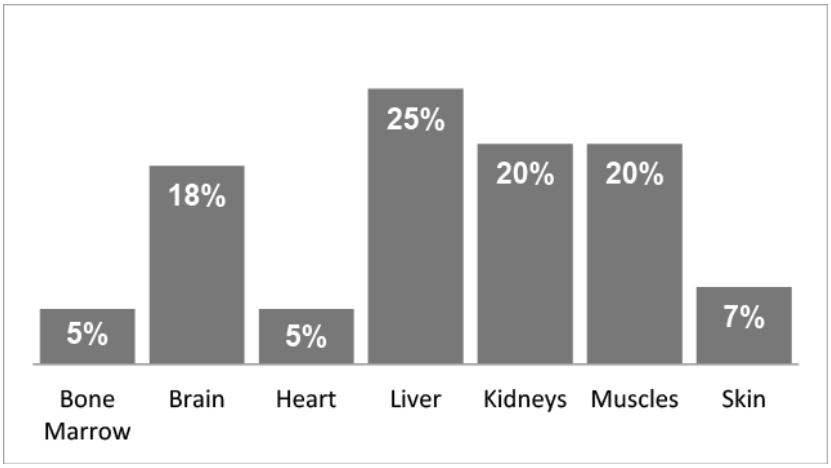
4. Consider the following statements:

"A concentric contraction of the biceps brachii causes extension at the elbow."

"A concentric contraction of the pectoralis major causes horizontal flexion at the shoulder."

Fig. 1 shows the distribution of blood to various parts of the body.

Fig. 1



(i) At what level of activity would blood distribution look like this?

---

[1]

(ii) What term is used to describe the re-distribution of blood during physical activity?

---

[1]

(iii) Explain how this re-distribution of blood during physical activity is achieved.

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[4]

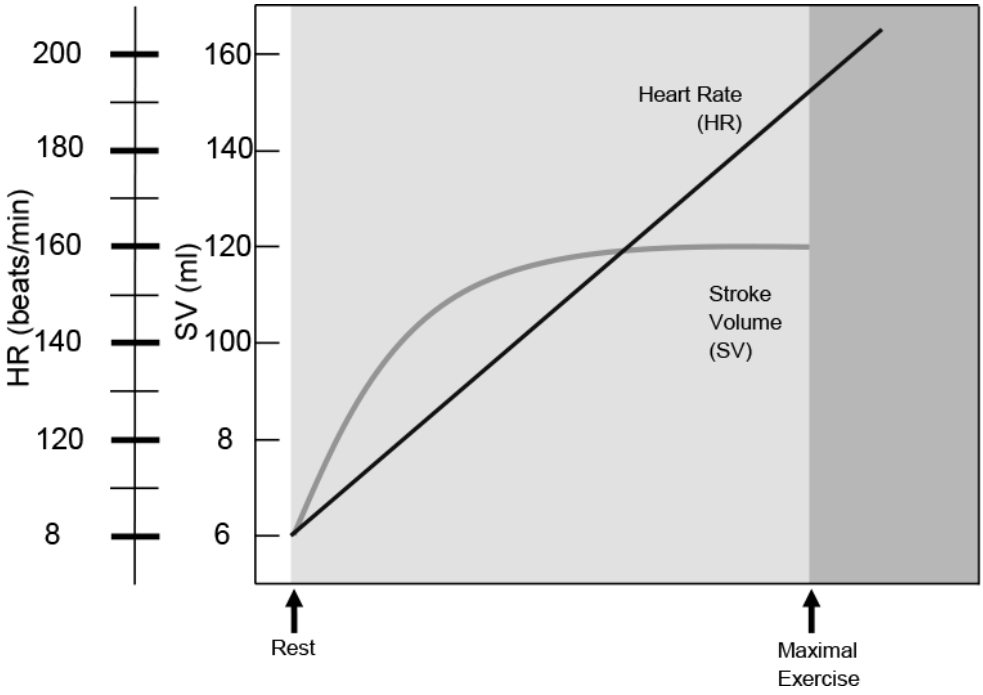
5. Describe intrinsic control of the heart during exercise.

---

[4]

6. **Fig. 2** shows the changes in stroke volume and heart rate from rest to maximal exercise.

Fig. 2



(i) Calculate the cardiac output when the heart rate is 180bpm. Show your working.

---

[2]

(ii) Explain the changes to stroke volume during sub maximal exercise.

---

[3]

7. Explain the cardiac cycle of the heart using the following key terms:

- Atrial systole
- Ventricular systole
- Diastole

---

[3]

8.

At the start of an endurance cycling event a cyclist will experience a redistribution of cardiac output.

Explain how and why the vascular shunt mechanism redistributes blood in a cyclist as they begin cycling at the start of the event.

[5]

9(a).

As a dance routine begins, the dancer's heart rate must be regulated. Thermoreceptors intrinsically detect an increase in temperature and act to increase heart rate.

Identify **two** neural receptors and explain how each regulates heart rate as the dance routine begins.

[4]

(b). After a strenuous match a netball player is told to complete an active cool down.

Explain how venous return mechanisms can aid venous return and prevent blood pooling as part of the netball player's recovery.

[4]

10. **Table 1** shows the distribution of blood in the body at rest and during exercise.

Tissue / organ	At rest (ml / min)	Blood flow (%)	During exercise (ml / min)	Blood flow (%)
Skeletal muscle	1000	**B**	16 000	80
Heart	250	5	750	3.75
Brain	750	15	750	3.75
Skin	**A**	10	1250	6.25
Kidneys	1000	20	750	3.75
Other	1500	30	500	2.50
Total	5000	100	20 000	100

Table 1

(i) Calculate the missing values for **A** and **B**.

A = _____

B = _____

[2]

(ii) Explain how the changes in the distribution of blood to the skeletal muscles and other organs is achieved during exercise.

Skeletal muscles _____

_____

_____

Other organs _____

_____

_____

[4]

END OF QUESTION PAPER

Question			Answer/Indicative content	Marks	Guidance
1	a	i	**2 marks for 2 from (At rest)** 14—6 l/min or l min^{-1} or litres/min or litres min^{-1} or l or litres 4,000—6,000 ml/min or ml min^{-1} or or ml **(During maximal exercise)** 220—40 l/min or l min^{-1} or litres/min or litres min^{-1} or l or litres 20,000—40,000 ml/min or ml min^{-1} or ml	2	<table><tr><th>Accept</th><th>Do not accept</th></tr><tr><td>1.</td><td>without units</td></tr><tr><td>2.</td><td>without units</td></tr></table> **Examiner's Comments** **Give an average value for cardiac output for a performer at rest and during maximal exercise.** • This question proved to be difficult. • Commonly, candidates confused the required cardiac output values with stroke volume values, heart rate or blood pressure. • Very few used the correct units, resulting in most candidates failing to gain marks.

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Question			Answer/Indicative content	Marks	Guidance
		ii	**4 marks for 4 from** **Conduction system should be considered in the correct order to gain marks.** 1 SA node or sino-atrial node or SAN **initiates** or **sends** an impulse 2 this causes **atrial** systole or **atrial** depolarisation or contraction of **atria** 3 blood forced or pushed or flows from the atria to the ventricles or out of the atria or through AV valves 4 impulse travels to or is received by the AV node or atrio-ventricular node or AVN / AV node sends impulse 5 impulse continues down the bundle of His and to the Purkinje fibres 6 Causing **ventricular** systole or **ventricular** depolarisation or contraction of **ventricles** 7 blood is ejected from the ventricles	4	**Accept / Do not accept** 1. / pacemaker 2. / systole or depolarisation or contraction on own 3. bicuspid and / or tricuspid vales / 4. / 5. / 6. / systole or depolarisation or contraction on own 7. / **Examiner's Comments** **Describe how the conduction system of the heart controls the systolic phase of the cardiac cycle.** • Knowledge of the conduction system was good, resulting in most candidates gaining maximum marks on this question. • Candidates were strong at linking the passage of the impulse (through the conduction system) with the systolic phases of both the atria and the ventricles, linked with the corresponding movement of blood through the heart. • Many candidates achieved 4 marks max before the end of their answer.

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<table>
<tr><th colspan="3">Question</th><th>Answer/Indicative content</th><th>Marks</th><th>Guidance</th></tr>
<tr><td></td><td>b</td><td></td><td>(e)* Levels of Response

<table><tr><th>Generic descriptors</th><th>Discriminators</th></tr><tr><td>Level 3 (8 – 10 marks)
A comprehensive answer:

• detailed knowledge & understanding
• effective analysis / critical evaluation and / or discussion / explanation / development
• clear and consistent practical application of knowledge
• accurate use of technical and specialist vocabulary
• high standard of written communication</td><td>At level 3 responses are likely to include:

• Detailed description of the receptors
• Detailed description of neural regulation of cardiac system
• Detailed description of neural regulation of respiratory system
◦ Inspiration and expiration
• Explanation of the effect on endurance performer</td></tr><tr><td>Level 2 (5 - 7 marks)
A competent answer:

• satisfactory knowledge & understanding
• analysis / critical evaluation and / or discussion / explanation / development attempted with some success
• some success in practical application of knowledge
• technical and</td><td>At level 2 responses are likely to include:

• Satisfactory description of the receptors
• Satisfactory description of neural regulation of cardiac system
• Satisfactory description of neural regulation of respiratory system
• Reference to the effect on endurance</td></tr></table></td><td>10</td><td>Examiner's Comments

Describe neural factors that regulate the cardiac and respiratory systems shown in Fig 2.

Using Fig 2, explain how these systems affect an endurance performer.

• This question was reasonably well answered.
• Candidates achieved a good spread of marks here.
• While there were more level 1 responses than level 3, a large percentage of candidates achieved level 2.
• Knowledge of the receptors was strong, with a high proportion of candidates identifying chemoreceptors, proprioceptors and baroreceptors as well as thermoreceptors.
• Many candidates described the changes accurately, by referring to an increase or decrease of the relevant levels. Weaker candidates got mixed up with the changes that each one detects.
• Knowledge of the cardiac system was considerably better known than the respiratory system with many candidates identifying the cardiac control centre and linking it to affecting the firing rate of the SA node.
• With regard to the respiratory system, most candidates could identify the respiratory control centre but then omitted to differentiate between inspiration and expiration, simply linking the RCC to affecting rate and depth of breathing without mentioning the steps in between.
• While most candidates could offer a description of the neural regulation of heart rate and breathing rate, few went on to explain the effects of how an increase in both would affect an endurance performer.
• This meant that a majority of</td></tr>
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<table>
<tr><th colspan="3">Question</th><th>Answer/Indicative content</th><th>Marks</th><th>Guidance</th></tr>
<tr><td></td><td></td><td></td><td>
<table>
<tr><td>specialist vocabulary used with some accuracy
• written communication generally fluent with few errors</td><td>performer</td></tr>
<tr><td>Level 1 (1 - 4 marks)
A limited answer:
• basic knowledge & understanding
• little or no attempt to analyse / critically evaluate and / or discuss / explain / develop
• little or no attempt at practical application of knowledge;
• technical and specialist vocabulary used with limited success
• written communication lacks fluency and there will be errors, some of which may be intrusive</td><td>At level 1 responses are likely to include:
• Basic description of the receptors
• Basic description of neural regulation of cardiac system
• Basic description of neural regulation of respiratory system
• Little or no reference to the effect on endurance performer</td></tr>
<tr><td>[0 marks] No response or no response worthy of credit.</td><td></td></tr>
</table>
Indicative content: Candidate responses are likely to include: (relevant responses not listed should be acknowledged)
Numbered points = knowledge /</td><td></td><td>responses were level 1 and level 2, as not all parts of the question had been addressed to a satisfactory standard.
• Stronger candidates displayed a good knowledge of the positive effects of taking in more oxygen and delivering more oxygen to the working muscles of an endurance performer. Being able to 'work for longer' was another frequently offered knowledge point.
• Some high level 3 answers were evident, with most at the lower levels.

Overall

• As a whole, this A&P question resulted in candidates achieving a good spread of marks.
• There were very few nil responses.</td></tr>
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Question	Answer/Indicative content	Marks	Guidance
	understanding **Bullet points** = likely to be development of knowledge **General** 1 Neural control is under Autonomic Nervous System or ANS control 2 uses the sympathetic nervous system **Receptors during physical activity** 3 Chemoreceptors ◦ detect **increase** in (pp)CO2 or carbonic acid or lactic acid or acidity ◦ detect **decrease** in (pp)O2 or pH 4 Proprioceptors ◦ detect (increase in) motor activity or movement 5 Baroreceptors ◦ detect **increase** in blood pressure ◦ detect **increased** stretch of arterial or blood vessel wall ◦ detect **increased** stretch of lung walls 6 Thermoreceptors or temperature receptors ◦ detect **increase** in blood temperature **Cardiac System** 7 information sent to the CCC or cardiac control centre (in medulla oblongata) ◦ impulses sent via the (cardiac) accelerator nerve 8 to increase the firing rate or stimulate the SA node 9 increasing heart rate (overall effect…) 10 increases cardiac output or Q ◦ Q = SV x HR / cardiac output = stroke volume x heart rate **Respiratory System**		

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Question	Answer/Indicative content	Marks	Guidance
	11 information sent to RCC or respiratory control centre (in medulla oblongata) 12 (which) **stimulates** the inspiratory centre (inspiration…) 13 increased stimulation or force of contraction of diaphragm ◦ via phrenic nerve 14 increased stimulation or force of contraction of external intercostals ◦ via intercostal nerve 15 recruitment or stimulation of additional (inspiratory) muscles e.g. sternocleidomastoid or SCM or scalenes or pectoralis minor (mechanics of inspiration compared to rest) 16 rib cage or ribs move up and out **further** 17 volume of thoracic cavity increases **further** 18 pressure inside thoracic cavity decreases **further** 19 **more** air rushes in 20 **increases depth** of breathing or tidal volume or TV (expiration) 21 expiratory centre stimulated (by baroreceptors or stretch receptors) 22 expiration becomes active 23 recruitment or stimulation expiratory muscles e.g. internal intercostals or obliques or rectus abdominus or transverse abdominus or abdominals (mechanics of expiration compared to rest) 24 rib cage or ribs move down and in **further** 25 volume of thoracic cavity decreases **further** 26 pressure inside thoracic cavity increases **further** 27 **more** air forced out 28 **increases rate** of breathing or breath		

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Question			Answer/Indicative content	Marks	Guidance
			frequency or ventilation **rate** (overall effect) 29 increases minute ventilation or VE ◦ VE = TV x f / Minute ventilation = Tidal Volume x breath frequency **Effect on endurance performer** 30 endurance performer relies on supply of oxygen to working muscles or aerobic respiration or the aerobic system (increased heart rate or cardiac output means …) 31 more oxygen or blood to the working muscles (per minute) (increased tidal volume or minute ventilation means …) 32 more oxygen inspired or breathed in (per breath or per minute) (so …) 33 increase in aerobic respiration 34 performer will be able to work for longer / greater endurance capacity 35 performer will be able to work at a higher intensity 36 less build up of lactic acid e.g. run or cycle or swim faster 37 delayed fatigue or lactate threshold or OBLA / (accept) — increased lactate threshold or OBLA **[Total: 30 marks]**		

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Question			Answer/Indicative content	Marks	Guidance
			Total	16	

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<table>
<tr><th colspan="3">Question</th><th>Answer/Indicative content</th><th>Marks</th><th>Guidance</th></tr>
<tr><td>2</td><td></td><td>i</td><td>3 marks for 3 from:
Mark first three attempts only

1 Skeletal or muscle or muscular pump
2 (Pocket) valves
3 Respiratory (muscle) pump
4 Smooth muscle</td><td>3</td><td>Mark first 3 attempts only
<table><tr><th>Accept</th><th>Do not accept</th></tr><tr><td>1 Muscular contractions around veins</td><td>Muscular contractions or muscles on own</td></tr><tr><td>2</td><td></td></tr><tr><td>3</td><td>Pulmonary pump / Respiratory muscles on own</td></tr><tr><td>4 Veno-constriction / increased venous tone / increased sympathetic stimulation (of veins)</td><td></td></tr></table>
Examiner's Comments

Gravity is one mechanism of venous return which aids the flow of blood back to the heart.
Identify three other mechanisms of venous return.

This question was answered well with a high percentage of candidates identifying the correct mechanisms. Many also described the mechanisms, which was not necessary for an "identify" command word.</td></tr>
</table>

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<table>
<tr><th colspan="3">Question</th><th>Answer/Indicative content</th><th>Marks</th><th>Guidance</th></tr>
<tr><td></td><td></td><td>ii</td><td>3 marks for 3 from: Submax 2 for points 1–5 Must hit pt 6 and / or pt 7 for max
(Increased volume of blood entering the heart …)

1… causes the (walls of the) atria to stretch
2(which) stimulates the SA node to increase heart rate or firing rate or rate of impulses
3… causes the (walls of the) ventricles to stretch / causes increased EDV or end diastolic volume
4(which) causes a stronger force of contraction or increased contractility (of ventricle walls) / causes decreased ESV or end systolic volume
5increase in stroke volume or SV or cardiac output or Q

6increase blood or oxygen supply to muscles

7increases endurance / delays fatigue or OBLA or lactate threshold / increases intensity of performance / increases removal or decreases levels of lactic acid or carbon dioxide or CO_2</td><td>3</td><td><table><tr><th>Accept</th><th>Do not accept</th></tr><tr><td>1</td><td></td></tr><tr><td>2</td><td>Increased heart rate on own</td></tr><tr><td>3 … causes walls of the heart to stretch</td><td></td></tr><tr><td>4</td><td></td></tr><tr><td>5 more blood pumped out of the heart per beat = BOD</td><td>Increase in CO</td></tr><tr><td>6</td><td>More blood or oxygen around body</td></tr><tr><td>7</td><td>7 Better or improved quality of performance</td></tr></table>
Examiner's Comments

Explain how an increase in venous return during exercise affects the quality of an athlete's performance.

Candidates were stronger at applying how an increased venous return affects performance than they were at using their theoretical knowledge of Starlings' Law to explain how this happens. Therefore, two marks out of three was the most common outcome. Candidates who did achieve maximum did so by linking an increased venous return with an increased stroke volume.</td></tr>
<tr><td></td><td></td><td></td><td>Total</td><td>6</td><td></td></tr>
</table>

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Question			Answer/Indicative content	Marks	Guidance
3			(e)* Levels of Response **Level 3 (8 – 10 marks)** A comprehensive answer: • detailed knowledge & understanding • effective analysis / critical evaluation and / or discussion / explanation / development • clear and consistent practical application of knowledge • accurate use of technical and specialist vocabulary • high standard of written communication **At level 3 responses are likely to include:** • Detailed explanation of VCC, VSM and VR • Balance of knowledge between VSM and VR ◦ explanation of Starling's Law • Knowledge of the changes in Q and distribution of Q from rest to max exercise. **Level 2 (5 – 7 marks)** A competent answer: • satisfactory knowledge & understanding • analysis / critical evaluation and / or discussion / explanation / development attempted with some success • some success in practical application of knowledge **At level 2 responses are likely to include:** • Satisfactory explanation of VCC, VSM and or VR although one may be covered in more detail than the other. • Reference to the changes in Q and distribution of Q from rest to max exercise.	10	Be aware of candidates who link: • - pt 5 to pts 14-16 • - pt 6 to pts 17-19 [valves = BOD] **Examiner's Comments** This question was reasonably well answered by some, while other responses lacked the detail needed to access higher than level 1 (4 marks). There were more level 1 responses than level 3 (8-10 marks) with a large percentage of candidates achieving level 2 (5-7 marks). The question parts most confidently and accurately answered were as follows: candidates showed good knowledge of the receptors, with a high proportion identifying the role of chemoreceptors, baroreceptors and proprioceptors. Most could also identify different mechanisms to aid venous return, though fewer described how the mechanisms work. With reference to the role of vascular shunt at the muscles and organs during exercise, most candidates could identify that there was an increase to the former and decrease to the latter but terminology was vague. For example, relatively few identified the specific role of arterioles and pre-capillary sphincters, referring instead to blood vessels, arteries or, in some cases, veins. Accurate use of the terms vasoconstriction and vasodilation was limited to the stronger answers. With regard to venous return, while most candidates knew what venous return was, few made the link with cardiac output so missed the opportunity to write about Starling's Law. In fact this seemed to be a common theme with candidates describing, to varying degrees of success, the three bullet pointed concepts but not linking them sufficiently to the main focus of the question by explaining their effect on cardiac output. The candidates who did this, were easily able to access level 3.

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Question	Answer/Indicative content		Marks	Guidance
	• technical and specialist vocabulary used with some accuracy • written communication generally fluent with few errors			
	Level 1 (1 – 4 marks) A limited answer: • basic knowledge & understanding • little or no attempt to analyse / critically evaluate and / or discuss / explain / develop • little or no attempt at practical application of knowledge; • technical and specialist vocabulary used with limited success • written communication lacks fluency and there will be errors, some of which may be intrusive	**At level 1 responses are likely to include:** • Basic explanation of VCC, VSM and / or VR • No or basic knowledge of the changes in distribution of Q from rest to max exercise.		
	[0 marks] No response or no response worthy of credit.			
	Indicative content: Candidate responses are likely to include: (relevant responses			

Question	Answer/Indicative content	Marks	Guidance
	not listed should be acknowledged) **Numbered points** = knowledge / understanding **Bullet points** = likely to be development of knowledge **Changes in cardiac output and distribution of cardiac output** At rest … 1 Cardiac output or Q is 5l / min ◦ for an average adult and trained performer 2 Distribution of blood or Q to muscles is low ◦ 15-20% (of Q) ◦ approx. 1l or 1l / min 3 Distribution of blood or Q to organs is high ◦ 80-85% (of Q) ◦ approx. 4l or 4l / min **As exercise intensity increases up to maximal …** 4 Cardiac output or Q increases ◦ (submax) 15-25l or l / min for trained performer ◦ (submax) 10-15l or l / min for average adult ◦ (max) 20-40l or l / min for trained performer ◦ (max) 20-30l or l / min for average adult 5 Distribution of blood or Q to muscles increases ◦ 80-85% (of Q) ◦ approx. 16-32l or l / min 6 Distribution of blood or Q to organs decreases ◦ 15-20% of Q ◦ approx. 4-8l or l / min 7 Distribution of blood to the brain remains constant ◦ approx 700-750ml 8 Distribution of blood to heart increases ◦ from 250ml at rest to 750ml		

Question	Answer/Indicative content	Marks	Guidance
	Control by the vasomotor centre and Vascular Shunt Mechanism 9 Vascular shunt mechanism controlled by vasomotor control centre or VCC ◦ located in medulla oblongata ◦ with cardiac control centre or CCC / with respiratory control centre or RCC 10 Chemoreceptors ◦ detect an increase in acidity or CO_2 or carbonic acid or lactic acid ◦ detect a decease in pH or O_2 11 Proprioceptors ◦ detect movement (of muscle, tendons and joints) 12 Baroreceptors ◦ detect an increase in blood pressure 13 Information sent to the vasomotor centre or VCC ◦ uses the sympathetic nervous system ◦ vasomotor nerves linked to tunica media or muscular layer of arteriole walls or pre-capillary sphincter or PCS **(muscles = increased blood flow)** 14 Decreased sympathetic stimulation of arterioles or pre-capillary sphincter or PCS leading to muscles 15 Vasodilation of arterioles leading to muscles 16 Vasodilation or relaxation of pre-capillary sphincter or PCS leading to muscles **(organs e.g. liver, digestive system or gut, kidneys = decreased blood flow)** 17 Increased sympathetic stimulation of arterioles or pre-capillary sphincter or		

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Question	Answer/Indicative content	Marks	Guidance
	PCS leading to organs 18 Vasoconstriction of arterioles leading to organs 19 Vasoconstriction or contraction of pre-capillary sphincter or PCS leading to organs Venous Return 20 the volume of blood returning to the heart (via the veins per beat) ◦ (problem) most of the blood has to travel against gravity or uphill ◦ (problem) low or zero blood pressure in the veins ◦ (solution) skeletal or muscular pump helps to squeeze blood back up to the heart ▪ during concentric contraction muscles push against vein walls ◦ (solution) pocket valves in veins prevent backflow of blood ◦ (solution) respiratory pump helps to pull or suck blood back up to heart ▪ during inspiration ▪ due to high pressure below diaphragm or in abdomen ▪ and low pressure above diaphragm or in thoracic cavity ◦ (solution) smooth muscle around veins causes them to (veno)constrict ▪ venomotor tone decreases lumen diameter / increases pressure in veins ◦ (solution) gravity from **above** the heart ◦ listing (not describing) venous return mechanisms 21 (during exercise) venous return or blood flow back to the heart **increases** 22 (relationship) stroke volume **depends on** or **relates to** venous return / if venous return increases **then** stroke volume or cardiac output increases		

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Question			Answer/Indicative content	Marks	Guidance
			◦ Starling's law (of the heart) (stretch of atrial walls) 23 (more blood enters atria) causing stretch of atrial walls ◦ this stimulates the SA node ◦ increasing firing rate of SA node / increasing heart rate or HR (stretch of ventricular walls) 24 (more blood enters ventricles) causing stretch of ventricular walls ◦ increased end diastolic volume or EDV ◦ this causes a more forceful contraction of ventricular walls ◦ decreased end systolic volume or ESV ◦ increasing stroke volume or SV (Effect of VSM and increased VR on performance) • increase in aerobic exercise / endurance capacity • delayed fatigue / delayed OBLA / delayed lactate threshold • faster recovery rate [Total: 30 marks]		
			Total	10	

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Question			Answer/Indicative content	Marks	Guidance
4		i	At rest / no activity	1 (AO3)	
		ii	Vascular shunt	1 (AO1)	
		iii	Four marks from: • more blood goes to the working muscles / less blood to non-essential organs • role of the vasomotor centre in passing on messages about where blood is needed / chemoreceptors / proprioceptors / baroreceptors • vasodilation of arterioles leading to muscles • vasoconstriction of arterioles leading to some organs / kidneys/gut • opening of pre-capillary sphincters to muscles • closing of pre-capillary sphincters to organs	4 (AO3)	Accept arteries and arterioles.
			Total	6	

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Question			Answer/Indicative content	Marks	Guidance
5			4 marks for 4 from 1 **Increase** in venous return / **more** blood enters the **right** atrium 2 The **right** atrium stretches 3 (Which causes the) SA node to **increase** rate of firing. 4 Increasing end diastolic volume (EDV) 5 **More** blood enters the **left** ventricle which will cause it to stretch / recoil with **more** force after stretch. 6 (This in turn) **increases** the stroke volume / forces **more** blood out per beat. 7 Temperature **increases** which **increases** heart rate 8 (Increased Temperature) **increases** the speed of nerve impulses	4	**Accept** / **Do not accept** 1. / More blood enters heart. 2. / 3. SA node increases stimulation. / 4. / 5. / DNA Starling's Law 6. / 7. / 8. / **Examiner's Comments** Once again this question was not well answered. Many candidates had difficulty interpreting this question, being unsure of what intrinsic control was and going on to make reference to medulla oblongata and sympathetic and parasympathetic nervous systems. Temperature increase was regularly identified but not always related to increasing heart rate. There was a lot of irrelevant theory in answers for this question, usually about chemoreceptors and baroreceptors or how nerve impulses travel down and through the heart. Candidates that did score often got points 1, 6 and 7 on the mark scheme. Lots referred to Starlings law but did not explain it.
			Total	**4**	

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Question			Answer/Indicative content	Marks	Guidance
6		i	Two marks for: • formula - Cardiac Output / Q = Heart rate x stroke volume/ 180 x 120 • calculation - Cardiac output / Q = 21600ml / minute / 21.6litres / minute	2 (AO2)	Must show units for full marks.
		ii	Three marks from: • stroke volume is dependent on venous return • (during sub maximal exercise) increased VR → increased SV • (at higher heart rates) Reduced filling time of heart • (at higher HR) Smaller end diastolic volume / EDV • (which means) heart is only partially filled with blood	3 (AO2)	
			Total	5	
7			Three marks for: 1 (Atrial systole) - atria contract **which** forces blood into the ventricles 2 (Ventricular systole) – ventricles contract **which** pumps blood out of the heart / into the aorta and pulmonary artery / to the body and the lungs 3 (Diastole) – relaxation phase or atria / ventricles relax **which** allows blood to enter heart	3 (AO1)	Candidate must link description of term to its effect on blood flow. **Examiner's Comments** Learners often wrote a lot for three marks. Some learners referred to the conduction system and made this the focus of their answer, ignoring the 'contractions' of the muscles and the requisite movement of blood through the system. Many did not access the marks for diastolic because they didn't mention the 'relaxation' of the heart muscle.
			Total	3	

Question			Answer/Indicative content	Marks	Guidance
8			Five marks from: **Sub max 4 marks from HOW:** (how) 1. Using vasomotor control/ VCC 2. (Vaso)dilation of arterioles leading to **working/ leg/ lower body** muscles 3. Opening/ dilation of pre-capillary sphincters to **working/ leg/ lower body** muscles 4. (Vaso)constriction of arterioles to (non-essential) organs/ muscles of upper body 5. Closing/ constriction of pre-capillary sphincters to (non-essential) organs/ upper body muscles (why) 6. **working/ leg/ lower body** muscles **need** most/more oxygen/ (oxygenated) blood 7. muscles of upper body **need** less oxygen/ blood 8. less oxygen/ blood **needed** at organs/ (non-essential) organs can cope with a (temporary) reduction in blood	5 (AO2)	**DNA 'contraction' of arterioles** **Accept arteries or blood vessels for arterioles** **Examiner's Comments** An applied question to cycling, candidates were expected to explain how and why the vascular shunt mechanism redistributed blood as the cyclist started an event. Most candidates recognised the involvement of the vasomotor control centre, arterioles and pre-capillary sphincters however struggled to meet the applied nature of the question. Some candidates' responses were too vague when referring to muscles rather than the 'working' muscles or 'leg/ lower body' muscles in the cyclist. To achieve maximum marks candidates must have touched on the 'why' aspect of the question which required a difference to resting conditions ie most/ more O_2 required at the working muscles, candidates struggled with this clarity providing just a description of redistribution.
			Total	**5**	

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<table>
<tr><th colspan="3">Question</th><th>Answer/Indicative content</th><th>Marks</th><th>Guidance</th></tr>
<tr><td>9</td><td>a</td><td></td><td>4 marks from:
<table><tr><th>Receptor (AO1)</th><th>Explanation (AO2)</th></tr><tr><td>1. chemoreceptors</td><td>2. detect increase in blood acidity/CO2/lactate / decrease in blood pH/O_2 causing heart rate to increase</td></tr><tr><td>3. proprioceptors/mechanoreceptors</td><td>4. detect movement/changes in joint angles causing heart rate to increase</td></tr><tr><td>5. Baroreceptors</td><td>6. detect increase in blood pressure and cause heart rate to decrease</td></tr></table></td><td>4
(AO1 × 2, AO2 × 2)</td><td>Sub max 2 for identification of receptors

Sub max 2 for explanation

Mark first two receptors named only.

Explanation must include what is detected and how HR is affected as the dance begins.

Do not accept: thermoreceptors (in question)

<u>Examiner's Comments</u> Receptors were named well. This is an area the candidates are clearly prepared well for. Lots of good answers for pts 2 and 4. Very few answers mentioned baroreceptors act to decrease HR if pressure increases. There was some confusion between baroreceptors and proprioreceptors. Candidates were getting marks for identifying receptors but were not explaining the effect on heart rate.</td></tr>
</table>

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Question			Answer/Indicative content	Marks	Guidance
	b		4 marks from: 1. Venous return mechanisms work to maximise / increase blood flow back to heart 2. … which means <u>netballer</u> won't get dizzy or faint or feel heavy legs / will maintain blood pressure/ speed up removal of lactic acid or waste products / decrease acute muscle soreness 3. (Pocket) valves in veins prevent backflow of blood (in legs) 4. (skeletal) muscle pump causes muscles of legs to contract squeezing veins (forcing blood back to the heart) 5. Smooth muscle in walls of veins contracts/venomotor tone (aids movement of blood) 6. Respiratory pump causes pressure differences within thoracic cavity (which aids movement of blood)	4 (AO1 × 1, AO2 × 3)	Do not accept: Gravity. DNA mechanisms on own, explanation required to gain mark. Points 2 - 6 AO2 – application is implicit due to context but points need to be explained fully (e.g. point 3 requires 'prevent backflow of blood' to make it <u>applied</u> K&U, which is AO2) <u>Examiner's Comments</u> Gravity mentioned a number of times, which for the question set was TV. Pt's 1 and 2 not accessed much or at all. Some quite vague explanations of how VR mechanisms work. Most got pocket valves. There was a misconception that smooth muscle allows blood to flow smoothly, indicating a belief that it reduces friction. Smooth muscle and respiratory pump were often identified but not clearly described. The first time in this specification that candidates have been asked to plot lines on a graph. There were some reasonably good attempts. Lots with no anticipatory rise, or plateau. Quite a few with peak at end of exercise. Some not breathing at rest! There were some easy marks here eg not starting at 0, however very few achieved full marks
			Total	8	

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Question			Answer/Indicative content	Marks	Guidance
10		i	Two marks for: 1A = 500 2B = 20	2 (AO3)	Units are not required. Examiner's Comments A very well answered question. Only a small minority unable to access both marks.
		ii	Four marks from: 1 (Skeletal muscles) Increase in heart rate/stroke volume/cardiac output means greater volumes of blood to muscles 2 (Skeletal muscles) Vasodilation of blood vessels/arterioles leading to muscles 3 (skeletal muscles) Opening/dilation of pre-capillary sphincters to muscles 4 (Other organs) Vasoconstriction of blood vessels/arterioles leading to other organs 5 (Other organs) Closing/constriction of pre-capillary sphincters to other organs	4 (AO3)	DNA Veins BOD Arteries Examiner's Comments A reasonably well answered question. Marks were given mainly for points 2-5. Very few candidates accessed point 1 on the mark scheme. Candidates had to refer to vasodilation and constriction when referring to the arterioles. Examiners allowed vasodilation/constriction or relax/contract for pre-capillary sphincters. However, simply relax or contract for arterioles was TV. A BOD was given for reference to arteries or blood vessels.
			Total	6	

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1(a).

(i) Give an average value for cardiac output for a performer at rest and during maximal exercise.

[2]

(ii) Describe how the conduction system of the heart controls the systolic phase of the cardiac cycle.

[4]

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(b).

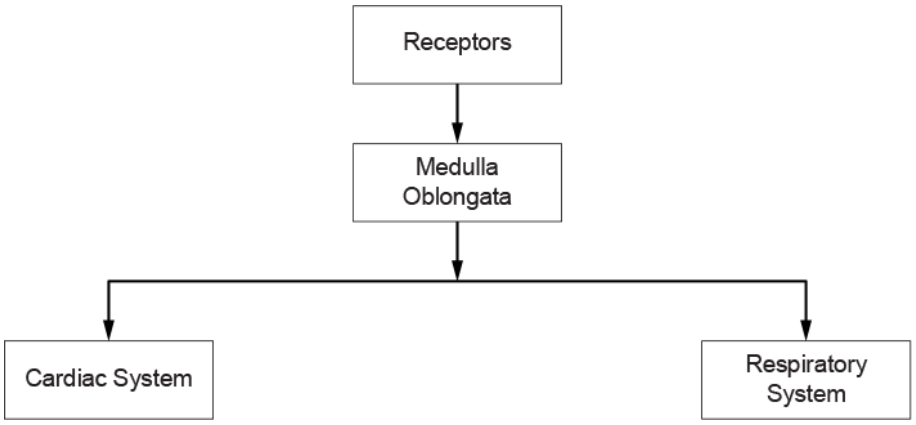

Fig. 2

Describe neural factors which regulate the cardiac and respiratory systems shown in Fig. 2 during exercise.

Using Fig. 2, explain how these systems affect an endurance performer.

[10]

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2. Gravity is one mechanism of venous return which aids the flow of blood back to the heart.

(i) Identify **three** other mechanisms of venous return.

---[3]

(ii) Explain how an increase in venous return during exercise affects the quality of an athlete's performance.

---[3]

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3.

Explain the changes in the distribution of cardiac output from rest to maximal exercise.

Make reference to:

- Vascular shunt mechanisms
- Venous return
- Control by the vasomotor centre

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[10]

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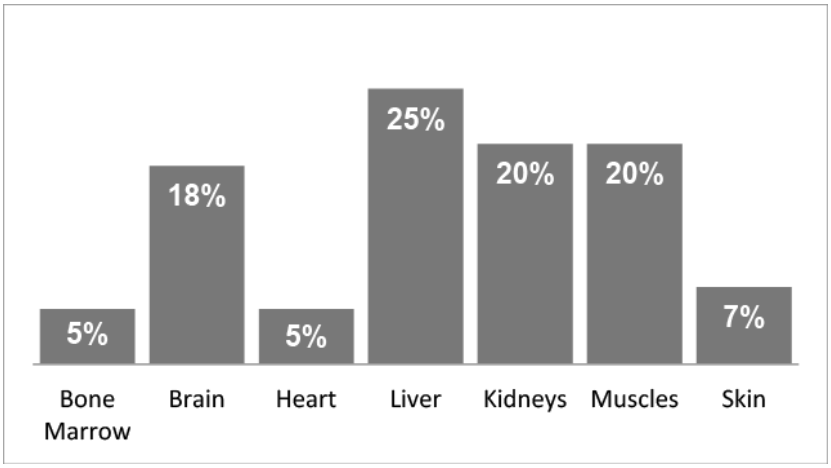
4. Consider the following statements:

"A concentric contraction of the biceps brachii causes extension at the elbow."

"A concentric contraction of the pectoralis major causes horizontal flexion at the shoulder."

Fig. 1 shows the distribution of blood to various parts of the body.

Fig. 1



(i) At what level of activity would blood distribution look like this?

---

[1]

(ii) What term is used to describe the re-distribution of blood during physical activity?

---

[1]

(iii) Explain how this re-distribution of blood during physical activity is achieved.

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---

[4]

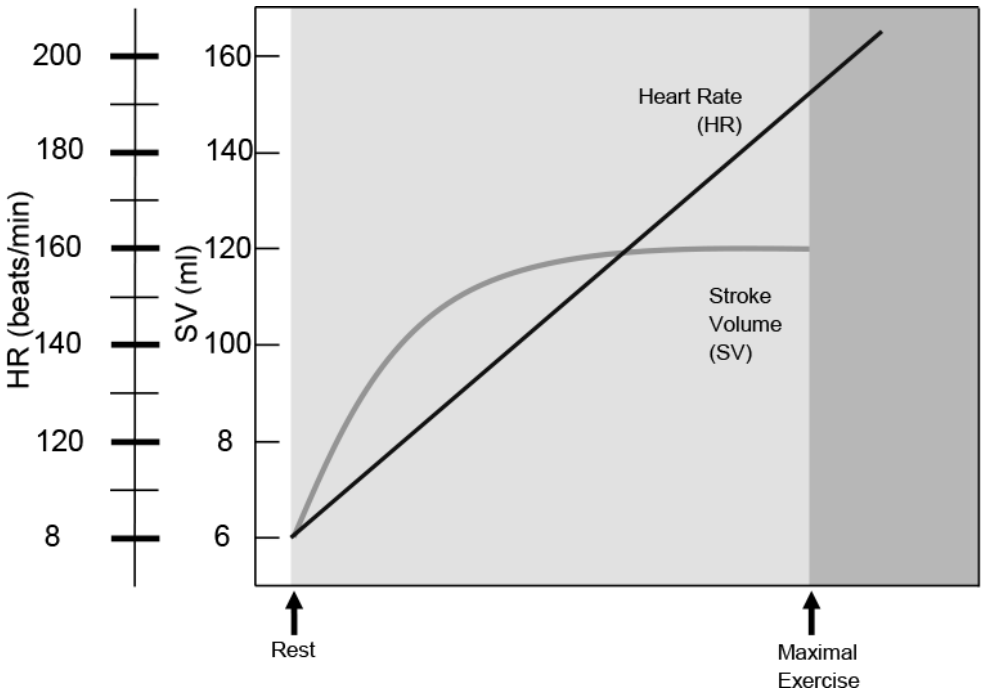
5. Describe intrinsic control of the heart during exercise.

---

[4]

6. **Fig. 2** shows the changes in stroke volume and heart rate from rest to maximal exercise.

Fig. 2



(i) Calculate the cardiac output when the heart rate is 180bpm. Show your working.

---

[2]

(ii) Explain the changes to stroke volume during sub maximal exercise.

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---

[3]

7. Explain the cardiac cycle of the heart using the following key terms:

- Atrial systole
- Ventricular systole
- Diastole

---

[3]

8.

At the start of an endurance cycling event a cyclist will experience a redistribution of cardiac output.

Explain how and why the vascular shunt mechanism redistributes blood in a cyclist as they begin cycling at the start of the event.

---

[5]

9(a).

As a dance routine begins, the dancer's heart rate must be regulated. Thermoreceptors intrinsically detect an increase in temperature and act to increase heart rate.

Identify **two** neural receptors and explain how each regulates heart rate as the dance routine begins.

[4]

(b). After a strenuous match a netball player is told to complete an active cool down.

Explain how venous return mechanisms can aid venous return and prevent blood pooling as part of the netball player's recovery.

[4]

10. **Table 1** shows the distribution of blood in the body at rest and during exercise.

Tissue / organ	At rest (ml / min)	Blood flow (%)	During exercise (ml / min)	Blood flow (%)
Skeletal muscle	1000	**B**	16 000	80
Heart	250	5	750	3.75
Brain	750	15	750	3.75
Skin	**A**	10	1250	6.25
Kidneys	1000	20	750	3.75
Other	1500	30	500	2.50
Total	5000	100	20 000	100

Table 1

(i) Calculate the missing values for **A** and **B**.

A = _____

B = _____

[2]

(ii) Explain how the changes in the distribution of blood to the skeletal muscles and other organs is achieved during exercise.

Skeletal muscles _____

_____

_____

Other organs _____

_____

_____

[4]

END OF QUESTION PAPER

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